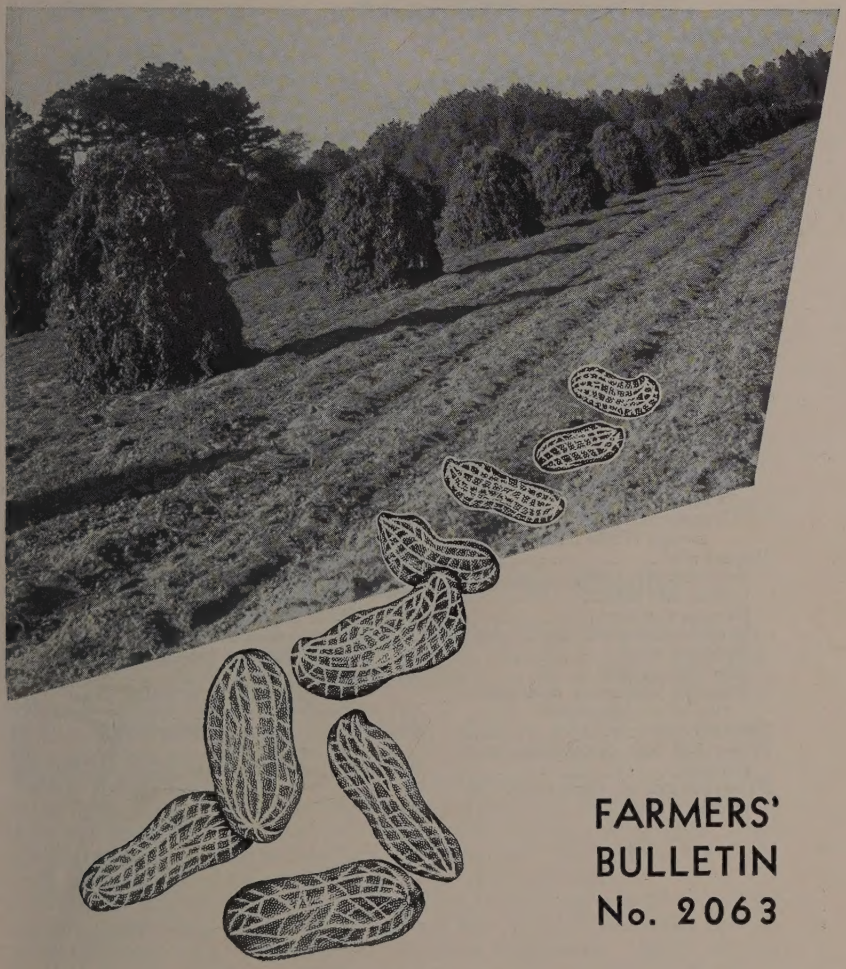
Growing *Peanuts*



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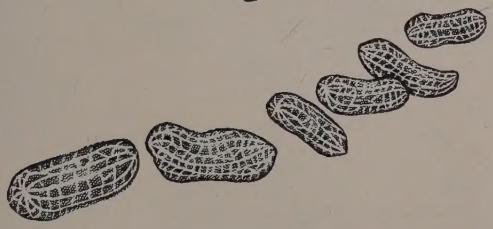
Growing Peanuts



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THE PEANUT is a legume and closely related to beans and peas, but differs widely from them because of its habit of developing the pods underground. Botanists classify the peanut of commerce as *Arachis hypogaea.* Although several other species of the same genus are found in South America, now regarded as the native home of the peanut, none of these has been grown commercially in the United States.

SOIL AND CLIMATE SUITABLE FOR PEANUTS

Both suitable soil and a favorable climate are essential to the successful commercial production of peanuts. Large areas of light-textured soils in the Northern States would be good for peanuts, if the climatic conditions were suitable.

For high yields and superior quality, peanuts require a moderately long growing period of 4 to 5 months with a steady rather high temperature and a moderate, uniformly distributed supply of moisture, especially during the period while the peanuts are forming, followed by dry conditions during harvesting and curing. Excellent crops of peanuts are often produced where the rainfall amounts to about 20 inches during the 4 to 5 months the peanuts are growing.

Climatic conditions suitable for peanut growing are found from southeastern Virginia southward along the Atlantic seaboard and in the gulf coast region westward to southern California. Much of this region, however, consists of heavy-textured soils, mountainous areas, swamp, and river bottoms—all unsuitable for the crop. Three areas—the Virginia-North Carolina region, the Georgia-Alabama-Florida region, and the Texas-Oklahoma region—produce most of the commercial crop, but only small parts of these general areas possess a combination of soil and other factors that are entirely suitable for peanut growing (fig. 1).

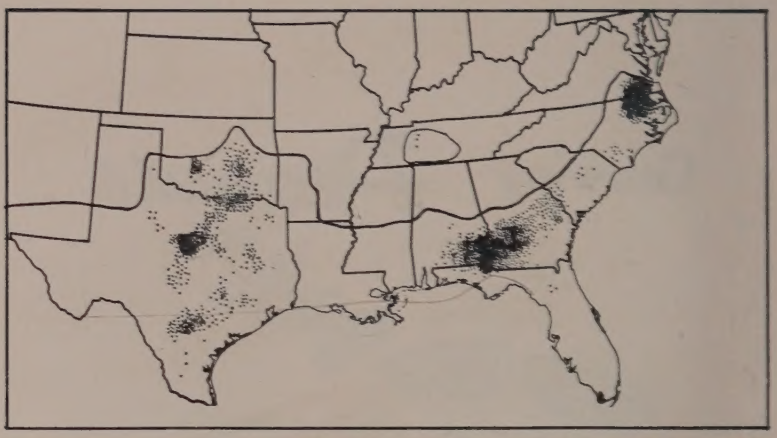

FIGURE 1.—Regions where commercial peanut production is most important. Each dot equals 1,000 acres in 1952.

A light-textured soil that will not harden or bake is desirable because (1) the plants are able to come up without injury or loss of numbers, (2) the pegs bearing the fertilized ovules are able to penetrate the surface and the pods develop normally, (3) the peanuts may be harvested without loss of the pods caused by hardening of the soil, and (4) the pods are not malformed and discolored. Peanuts grown for harvesting by animals, chiefly hogs, are adaptable to less favorable soils. Malformed and discolored pods are not so important with these, and there is no loss of peanuts while harvesting.

In addition to having a light texture the soil should be free from stones, gravel, iron concretions, and other similar material that cannot be easily screened or blown out of the harvested crop. Small pebbles of about the same size as the shelled peanuts are most troublesome. Because pebbles cannot be easily removed during the picking operation, they cause a serious loss to the grower and constitute a hazard to the sheller and processor.

Soils that contain a high proportion of organic matter are likely to produce discolored pods that render them unfit for some trade purposes; moreover, the appearance and quality of the kernels are also likely to be lowered.

Large quantities of available nitrogen and potash in the soil are usually unfavorable to the production of high-quality peanuts. Soils that are either strongly acid or alkaline may be very unfavorable for peanuts. Strongly alkaline soils seem to be especially unfavorable. Peanuts thrive best on soils having a slightly acid reaction, a pH of 6.0 to 6.5, provided there is enough lime and other elements present for their normal development.

Soil and subsoil depth and character and many other factors should be considered in determining the suitability of a tract for peanut growing (fig. 2). Recently peanut soil types have been classified roughly into four groups—those that produce high, moderately high, moderate, and low yields of peanuts. The soil groups are designated as excellent, good, fair, and poor. These classifications are based

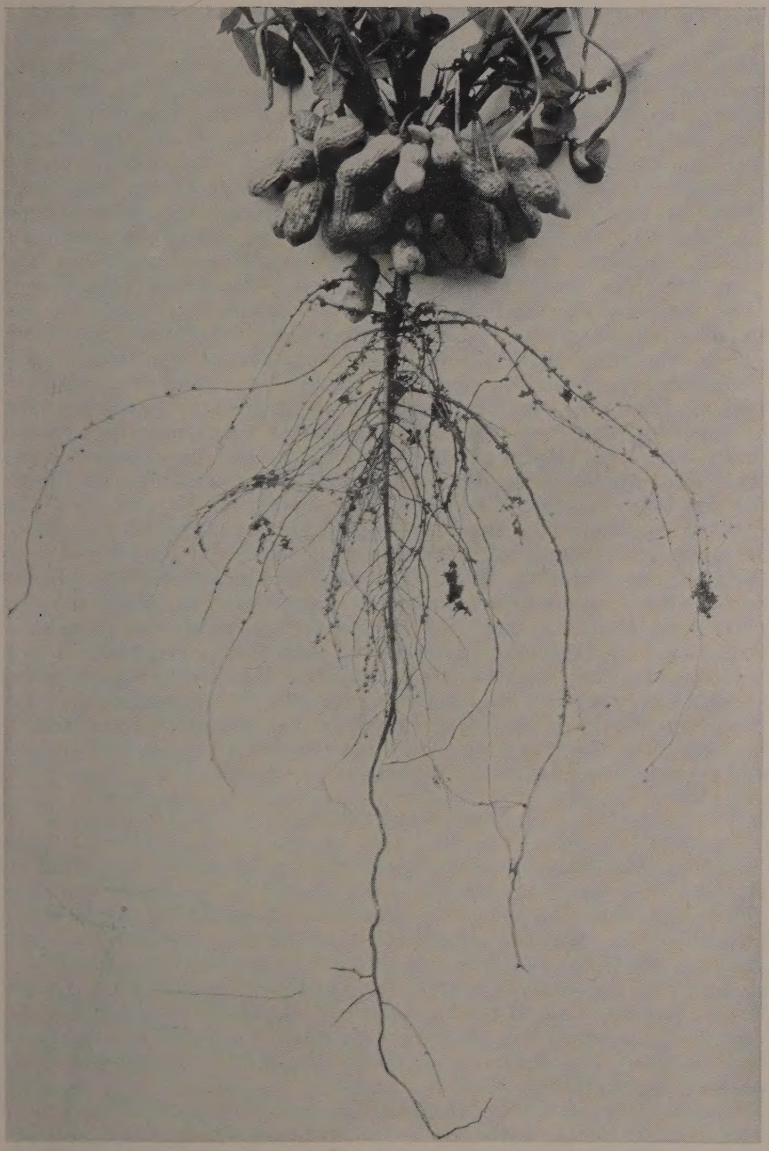

FIGURE 2.—Root system of Spanish peanut at harvest. The roots penetrated to a depth of about 18 inches with an equal spread.

primarily on the texture and depth of the surface soil layers, drainage, the character and depth of the subsoil layers, and other characteristics such as stoniness, gravelliness, and steepness of slope.

Excellent soils for peanuts have good drainage and yellow, brown,

gray, or red sandy loam or fine sandy loam surface layers, with friable sandy clay loam, sandy clay, or clay loam subsoils beginning 10 to 20 inches below the surface. The subsoil should always be crumbly, easily worked by the fingers, and have a color that indicates free air movement in the soil. It should extend to a depth of about 3 feet or more before further noticeable changes are found. Nearly all the excellent soils for peanuts are found on level ground or on slopes favorable for tillage without danger of excessive erosion. Very little, if any, gravel or stones occur in the soil, and rock ledges never appear on the surface. Examples of excellent soils are the Norfolk, Marlboro, Tifton, and Magnolia sandy loams or fine sandy loams (on slopes less than 10 percent) in the Coastal Plain; Duval, Tiller, and Nacogdoches sandy loams or fine sandy loams in the Southwest.

The good soil types, in general, are not greatly different from those considered as excellent, but will have some characteristics not quite so favorable. A shallow, good soil usually has a depth of about 8 inches. The surface layers may be thinner than would be required for an excellent soil; or the surface soil may be coarser, as in a coarse sandy loam. Examples of the good soils are the deep phases of the Norfolk or Ruston sandy loam or fine sandy loam in the Coastal Plain; the Appling coarse sandy loam or moderately eroded phases of the Cecil or Appling sandy loam in the Piedmont; and the Bowie, Webb, or Miles sandy loams in the Southwest.

Soils characterized by shallow topsoil, 4 to 7 inches in depth, imperfect drainage, and subsurface layers of deep sand or of impervious clays are classified as only fair for peanut growing. Many soils in the Coastal Plain have the unfavorable deep sandy subsurface layers.

Extensive areas in the Piedmont and the Red Belt of the Coastal Plain are very shallow; tight, impervious subsoils are commonly found in the Gulf Coastal Plain of Texas. Soils of this type and those having unfavorable factors that are more pronounced are classified as poor and are not recommended for peanuts.

CROPPING SYSTEMS

Peanuts should not be grown year after year on the same land or even for 2 years in succession. They should be treated as one of a number of crops grown on the farm, not as a specialty, and be fitted into this plan. Because of the ability of the peanut to use fertilizer residues left in the soil from the previous season's crop, it is a desirable crop to follow some heavily fertilized crop such as corn. Since large amounts of plant food are removed from the land by peanuts (see p. 6), the cropping plan should include soil-building crops and cover crops. The cover crops, especially, should be planted after peanuts are harvested.

Unfortunately some of the most important advantages of crop rotation are unfavorable to the production of heavy yields of high-quality peanuts. When peanuts follow sweetpotatoes, soybeans, or other crops that leave large quantities of heavy-stemmed green vegetable matter at or near the surface of the soil, the conditions are extremely favorable for the winter carryover of the sclerotia of the southern root rot, a disease that is causing heavy losses to peanuts.

The pest-control measures employed with crops occupying the land during earlier seasons must be considered. Benzene hexachloride is

known to cause off-flavor in peanuts when used directly on peanuts and sometimes when used on other crops during the previous season. Some other organic pesticides may have similar effects, especially those materials that build up in the soil season after season. Peanuts should not be grown on land that has been treated with questionable materials.

Specific crop rotations including peanuts vary widely. In a rotation experiment in Virginia, corn with crimson clover as a cover crop was grown the first year, early potatoes followed by cowpeas the second year, and Spanish peanuts the third year, followed by rye as a winter cover crop. This rotation was continued for 10 years, and in the last 3-year rotation the plots yielded about 3 times the quantity of peanuts as was produced on an adjacent plot growing peanuts continuously. Grain sorghum could be substituted for the cowpeas the second year with less danger of causing a buildup of root rot.

A 2-year corn and peanut rotation is very widely practiced in the Tidewater section in Virginia. The peanuts are followed by a cover crop of crimson clover sowed as soon as the peanuts are harvested. The crimson clover is turned under, and corn is grown the second year. Only the grain is harvested, and the leaves and stalks are disked into the soil. Commercial fertilizer is used on both the peanuts and the corn. On farms where the total acreage to be used for peanuts is small, a 3-year rotation, usually by adding a grass crop, is often followed. Yields of peanuts from a 3-year rotation are usually increased over those from a 2-year rotation.

A 3-year rotation with peanuts, corn, and cotton is extensively followed in Alabama. A 2-year rotation with peanuts and cotton or with corn and peanuts is also extensively used. The best results were obtained with a 3-year rotation of cotton followed by lupines as a cover crop, then peanuts the second year, and corn the third year. A 6–8–12 commercial fertilizer mixture was applied at the rate of 600 pounds per acre to the cotton, a 0–8–12 mixture of 300 pounds per acre to the lupines, and no fertilizer to either the peanuts or the corn.

In another 3-year rotation in Alabama, peanuts were grown the first year followed by a winter cover crop of lupines, corn was grown the second year, and peanuts harvested by hogs the third year. Average yields were 1,800 pounds of peanuts, 50 bushels of corn, and 431 pounds of pork per acre.

State experiment station personnel, county agents, and other agricultural advisers who are familiar with the local cropping systems are the best sources of information on rotations involving the growing of peanuts in each locality.

Land from which a crop of peanuts has been harvested is left practically bare and exposed to the full effects of water and wind erosion. The immediate sowing of a cover crop is extremely desirable. Crimson clover, oats, rye, or other crops that will form a quick ground cover can be used. The seed of the cover crop is sown between the stack rows without waiting for their removal (fig. 3). After the picking has been done the stack-row strips can be planted.

SOIL PREPARATION

Deep, thorough plowing that moves every inch of the plowsole and that completely buries all cover crops or other material on the surface

FIGURE 3.—Sowing a cover crop of rye between stack rows of recently harvested peanuts.

is an important factor in the growing of an excellent crop of peanuts. The actual depth of plowing must be determined to some extent by the depth of the topsoil, but very shallow soils seldom yield profitable crops of peanuts and they should be avoided.

Light-textured soils that are suitable for growing peanuts are particularly subject to leaching and wind damage; hence, plowing is usually done just prior to the planting time. Fall, winter, or very early spring plowing interferes with the cover crop that should occupy peanut land during the winter months.

Both the light 1-horse turning plow and the 2-horse plow have been almost completely displaced by tractor plows of either the moldboard or disk types. These implements, followed by a tractor-drawn double-disk harrow and a smoothing harrow, are capable of making a deep, mellow seedbed that is extremely favorable for peanuts. If the land has been well fitted and leveled, only a surface stirring will be necessary before planting. This should be sufficiently thorough to destroy all weeds.

On sloping land that is subject to erosion, peanut rows should be located on the contour. With severe erosion conditions, alternate strips should be in a noncultivated crop (fig. 4).

SOIL AMENDMENTS

Although the peanut is a legume and capable of gathering nitrogen from the air, it is a soil-exhausting crop as usually grown. A crop consisting of about 2,000 pounds of unshelled peanuts and 4,000 pounds of hay removes about 140 pounds of nitrogen, 24 pounds of phosphoric acid, 103 pounds of potash, and 90 pounds of lime. Practically all the plant, including part of the roots, is removed from the land and little of it is ever returned to the soil.

An undetermined amount of nitrogen is gathered by the nitrifying organisms and used in the growth of the plant; hence, not all the nitrogen found in the harvested crop comes from the soil. Nevertheless, the heavy demands made by a crop of peanuts necessitate careful attention to farming and fertilizer practices to keep the land at a highly productive level.

Failure to receive marked responses in peanut yields from the application of fertilizer directly to the crop has often led to the conclusion that fertilizers do not pay. In many cases it has been found advisable to use a part or all of the fertilizer on other crops in the rotation instead of directly on the peanuts. The peanut plant is capable of absorbing nutrients from soils that are at a low nutritional level and it may impoverish the land for later crops. Recommendations for fertilizing peanuts differ among States, but they generally agree on fertilizers containing low nitrogen, fairly high phosphorus, and medium to low potash. The mixture and method of application are determined by local conditions and customs. In Georgia broadcast application before planting is sometimes practiced.

In Alabama fertilizer recommendations for good soils—those that produce 1,500 pounds or more of peanuts per acre—are 300 to 400 pounds per acre of an 0–12–20 mixture or 200 pounds of superphosphate and 100 pounds of muriate of potash. On medium producing soils that yield 1,000 to 1,500 pounds of peanuts per acre, recommendations are 300 to 400 pounds per acre of a 0–12–20 mixture, or 1,000 pounds of basic slag and 100 to 150 pounds of muriate of potash per acre.

In Florida 0–14–10, 4–10–7, 3–8–5, and 2–10–4 mixtures are extensively used. About 400 pounds per acre is a common rate of application.

In Georgia the 0–14–10, 3–9–9, 4–8–6, and 4–8–8 mixtures are extensively used at 200 to 400 pounds per acre.

In North Carolina, with the high rate of phosphorus fertilization of other crops grown in rotation with peanuts, there is seldom any response to the use of this material on the crop. When heavy potash applications were not made to the previous crop, the use of 75 to 150

FIGURE 4.—Peanuts planted on the contour and in crop strips, recommended on land subject to erosion.

pounds per acre of muriate of potash is profitable. Nitrogen has given little response.

In Virginia the practices are similar to those followed in North Carolina. Many growers apply the fertilizer to the other crops in the rotation. For use on the peanuts the most common practice is to use 400 to 500 pounds per acre of a 2–12–12 or a 0–14–14 mixture. Potash and calcium seem to be the elements most needed by peanuts.

In the Southwest additional fertilizer is seldom used when the peanuts follow a heavily fertilized crop such as cotton. When peanuts are grown as a cash crop and the vines are removed from the soil, 200 pounds per acre of a 2–12–6 fertilizer is often used. Superphosphate alone is sufficient for land in the Southwest that is not deficient in potash.

The relatively small amounts of commercial fertilizer ordinarily used on peanuts may be applied at planting time by using a 1- or 2-horse or a tractor-drawn 1- or 2-row planter equipped with fertilizer distributors. Precautions should be taken to prevent the fertilizer from coming in direct contact with the seed. Peanut rows are sometimes laid off and the fertilizer applied a few days before the time of planting. When this method is followed, a 1- or 2-row distributor is used that applies the fertilizer, mixes it into the soil, and marks the rows. Excellent results are obtained by applying the fertilizer in bands, 2 to 3 inches to the side and 2 inches below the level of the seed. Another, but less desirable, method is to apply the fertilizer along each side of the row after the plants come up and then cultivate it into the soil.

Lime and Gypsum

The various forms of lime and ground limestone perform two functions in the soil: (1) Change the soil reaction, making it less acid; and (2) supply calcium for the nutrition of the peanut plant. Gypsum, commonly known as land plaster, supplies calcium without materially affecting the reaction of the soil.

Poorly filled large-seeded peanuts that have had a normal growing season are a strong indication that the land is deficient in calcium. This provides a valuable lead for guidance the next season. While additional calcium is not always needed on soil used for peanuts, it would be a great mistake for the grower to conclude that his land does not require calcium. A soil test should be made to determine how much ground limestone will be required to correct soil acidity and to supply calcium.

The use of gypsum, or land plaster, on peanuts is an old practice. It is more beneficial to the large-seeded Virginia-type varieties than to the Spanish. Where the calcium level of the soil is low, gypsum applied to the fruiting zone of peanut plants at blooming time reduces the number of pops, causes the pods to fill, and usually improves yields. Where the calcium level of the soil is already high, the additional calcium has no effect. Experiments in Georgia in 1941–50 on the application of gypsum to the fruiting zone of large-seeded Virginia-type peanuts at the blooming period caused the pods to fill and resulted in heavy yields. Before those experiments it was believed that the Virginia peanuts were unadapted to most parts of the lower South.

Gypsum is usually applied at 400 to 500 pounds per acre directly to the plants at full bloom. It is washed onto the soil around the

plants by rain. If applied before planting the seed, it is not so effective in causing well-filled pods.

TYPES AND VARIETIES OF PEANUTS

For commercial purposes peanuts are grouped into three types: (1) The large-seeded Virginia with both bunch- and runner-type plants; (2) the true Runners; and (3) the Spanish. Some strains and varieties that roughly resemble the Spanish in appearance, such as the Valencia and the Tennessee Red and Tennessee White, are sometimes grouped with the Spanish, but they are distinct. The words "Spanish," "Virginia," and "runner" have been used throughout this bulletin to include all varieties of the particular type of peanut.

These classifications are loose ones and intermediate forms are found. Certain Virginia varieties of the runner habit and some of the true Runners merge into each other; moreover, crosses have been made between the so-called types. Dixie Runner is a hybrid between Dixie Giant, a true Runner, and Spanish. Other species even are included in crosses.

At present market requirements are practically confined to the three recognized commercial types of peanuts. Because of climate, soil, and other factors the culture of these types and varieties within the types is especially developed in certain areas; for example, the production of the large-seeded Virginia type in the Virginia-Carolina area and the production of the Spanish in the Southwest. Shelling and handling plants in the peanut-growing areas are equipped to take care of certain types and sizes of peanuts. All these factors must be considered in selecting the kind of peanuts to be grown.

To avoid repetition, the meaning of terms used throughout the descriptions follows: The "season" means time from seeding to harvest. This period may be lengthened a few days by dusting or spraying for insect and disease control. "Shelling percent" is the percentage of the unshelled peanut that is seed. The "seed count" is the number of shelled peanuts to the pound after the small shrivels have been screened out. Seed count and seed size vary with the season. "Extra large" shelled peanuts are those retained by a $^{22}/_{64}$-inch slotted screen.

VIRGINIA-TYPE VARIETIES

The large-seeded Virginia-type varieties are grown in southeastern Virginia, northeastern North Carolina, in Tennessee, parts of Georgia, and in a few other locations where conditions are suitable. The culture of the large-seeded Virginia-type peanut may be greatly extended by close attention to supplying the calcium requirements of the plant.

Virginia-type peanuts are either bunch or running in habit of growth. The Virginia bunch is upright, but on fertile soil with ample moisture and good culture it assumes a somewhat spreading habit of growth late in the season. Typical varieties attain a height of 18 to 22 inches, a spread of 28 to 30 inches. With 33- to 36-inch rows they seldom completely cover the ground. The pods are borne within a few inches of the base of the plant.

The Virginia runners have a spreading habit of growth, often completely covering the space between the 33- to 36-inch rows. The pods

FIGURE 5.—Virginia Bunch Large peanut, showing pod characters and shelled peanuts.

are borne on pegs arising on the side branches, often as much as 15 inches from the base of the plant. Intermediate forms having an upright spreading habit are found. The bunch varieties are easier to cultivate and harvest, but the yields are usually lower than those of the Virginia runner group. Runner varieties also cover the ground more completely and give a greater degree of weed control through their dense covering of the soil.

Virginia Bunch Large

Season about 130 days from seeding to harvest. Plants upright, usually 18 to 22 inches tall, with about the same spread. Foliage rather small. Pods borne mainly in a loose cluster around the base of the plant, but some are on pegs arising on the side branches up to about 10 inches from the base of the plant; typically 2-seeded, a small proportion 1-seeded and 3-seeded (fig. 5). Shells rough, thick, and many are deeply constricted between the seeds. Seeds loose in pods after curing, cylindrical, pointed, and flesh-colored. Shelling percent, 65 to 68. Seed count ranges from 480 to 650 per pound, but the seed size varies greatly with the season. Proportion of extra large (those retained by a $^{22}/_{64}$-inch slotted screen) shelled peanuts varies from 20 to 40 percent. Extremely high quality when properly cured. It produces excellent peanut butter, salted peanuts, and other edible goods. An excellent sort for sale in the shell.

Virginia Bunch 46–2

Originated from a hill selection of Virginia Bunch Large and is similar in general characters to the parental stock, but its growth habit is more uniform, its yields are larger, and a greater proportion of the kernels are extra large. It is a very promising variety that is being grown in the Virginia area to a considerable extent.

Virginia Bunch Small

This variety is similar to Virginia Bunch Large except the seeds are smaller and it has a slightly higher shelling percent—67 to 72 (fig. 6). Seed count per pound ranges from 600 to 800. Proportion of extra large shelled peanuts from 5 to 13 percent. Of high quality, similar to Virginia Bunch Large.

FIGURE 6.—Virginia Bunch Small peanut, showing pod characters and shelled peanuts.

Virginia Bunch 67

Season about 130 days. Plants upright, usually about 20 inches tall, with a spread of 30 to 36 inches and 36-inch rows often completely closed. Foliage rather small, leaflets 1 to 2 inches long, stems slender. Pods borne around base of plant and on branches as far as 10 inches from the base of the plant; typically 2-seeded, quite smooth. Seeds fairly tight in the pods, flesh-colored, shaped like other Virginia strains. Seed count ranges from 800 to 900 to the pound. Shelling percent 72 to 74. Quality for processing good to excellent, but strongly affected by the method of curing.

Holland Jumbo

Season about 140 days. Plants typically coarse, vigorous, with a spreading habit of growth, height about 18 inches, spread 36 to 38 inches, with rows spaced 33 inches apart completely closed. Pods borne up to 15 inches from the base of the plant; typically 2-seeded, a small proportion 1-seeded and 3-seeded. Shells rough, thick, and many are deeply constricted between the seeds (fig. 7). Seeds

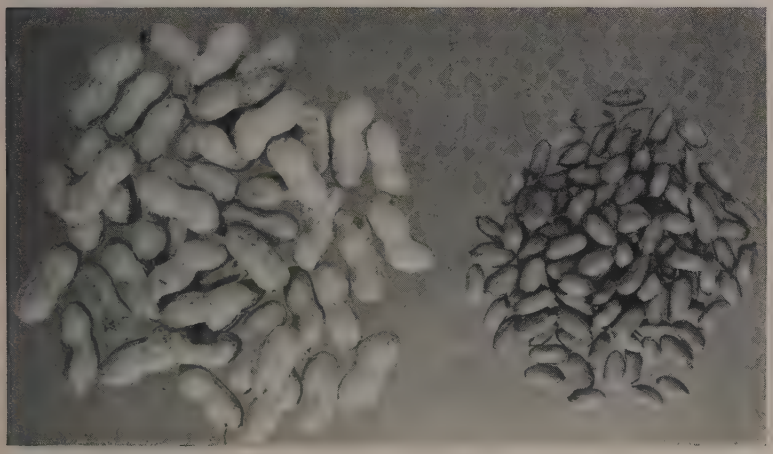

FIGURE 7.—Holland Jumbo peanut, showing pod characters and shelled peanuts.

FIGURE 8.—Holland Station Runner peanut, showing pod characters and shelled peanuts.

loose in pods after curing, cylindrical, length 2 to 2½ times the diameter, pointed, and flesh-colored. Shelling percent 65 to 66. Seed count ranges from 450 to 700 to the pound, and the size varies greatly with the season. Proportion of extra large shelled peanuts ranges from 18 to 40 percent, depending upon the season. Of high quality, like Virginia Bunch Large and Virginia Bunch Small.

Holland Station Runner

Season about 140 days. Plants vigorous and uniform, with a spreading habit of growth; height 20 to 22 inches, spread 36 inches or more, completely closing 33-inch rows. Pods borne up to 14 inches from the base of the plant; typically 2-seeded, a small proportion 1-seeded and 3-seeded. Shells rough, thick, and many are deeply constricted between the seeds. Seeds loose in the pods after curing, cylindrical with pointed ends, and flesh-colored (fig. 8). Shelling percent 65 to 66. The seed count ranges from 650 to 850 to the pound, and the size of the seed varies greatly between seasons. Proportion of extra large shelled peanuts as much as 15 to 20 percent under very favorable conditions. Of high quality like the other Virginia-type varieties described. Its weakness is in the small size of the seeds, with a small and variable proportion of extra large.

RUNNER-TYPE VARIETIES

Runner-type peanuts are commonly known as African Runner, Alabama Runner, Georgia Runner, Carolina Runner, Wilmington Runner, or merely Runner. The plants are similar in general character to the runner varieties of Virginia-type peanuts. They are extremely vigorous, usually completely closing the spaces between the rows; however, on thin land, especially if dry weather occurs during the crop season, the growth may be very much restricted. The pods and seeds of runners are intermediate in size and between the Virginia and the Spanish types. The pods are typically 2-seeded and may be cylindrical in shape, with little constriction between the seeds; stem end round and the other end pointed with a slight keel. The shells are moderately thick, but not so thick as the Virginia varieties, strong with shallow veining and corrugation; the seeds are crowded in the pods, with the adjacent ends flattened, and average about 900 to the pound.

Because of the ability of the runner varieties to yield a heavier crop than the Spanish and to their widespread adaptability to the soil and climatic conditions of the Southeast, they are now grown in that region to a much greater extent than in the past. However, because of the ridging of the seeds that makes complete blanching difficult, some runner varieties have a greater loss during processing than that with Spanish or Virginia bunch, and to some extent than that with Virginia runner varieties.

Dixie Runner

Season about 145 days. This hybrid was produced by the Florida Agricultural Experiment Station, and it is probably the best known of the improved runner varieties. Plants vigorous and typical of the true runner type; height 18 to 20 inches, with a spread of 40 inches or more. Pods borne on the side branches for several inches from the base of the plant; typically 2-seeded; cylindrical, not deeply furrowed or indented. Seeds oval with a length about twice the diameter, tightly packed in the pods with adjacent ends flattened (fig. 9); ridged, flesh-colored. Shelling percent ranges from 70 to 76. Seed count ranges from 1,000 to 1,100 to the pound, and the size of seeds varies greatly between seasons and locations. Counts as low as 900 to the pound have been made under favorable conditions. The quality of the processed material is good but slightly under that of the Virginia varieties.

North Carolina Runner 56–15

Season about 145 days. In this strain, developed by the Georgia Agricultural Experiment Station, the plants are uniform, rather slender with fine foliage, typically 18 to 20 inches tall, with a spread of about 40 inches. Pods borne on the branches for several inches from the base of the plant (fig. 10); cylindrical, typically 2-seeded; practically no ridging and only slight venation. Seeds tightly packed in the pods with the adjacent ends flattened and chunky, length typically about twice the diameter, flesh-colored. Seed count ranges from 900 to 1,050 to the pound. The yield and shelling percent are the same as those for Dixie Runner. The quality of the product is also similar to that of Dixie Runner.

SPANISH-TYPE VARIETIES

Spanish peanuts include forms commonly known as White Spanish, Small Spanish, Improved Spanish, and Spanish. The plants have

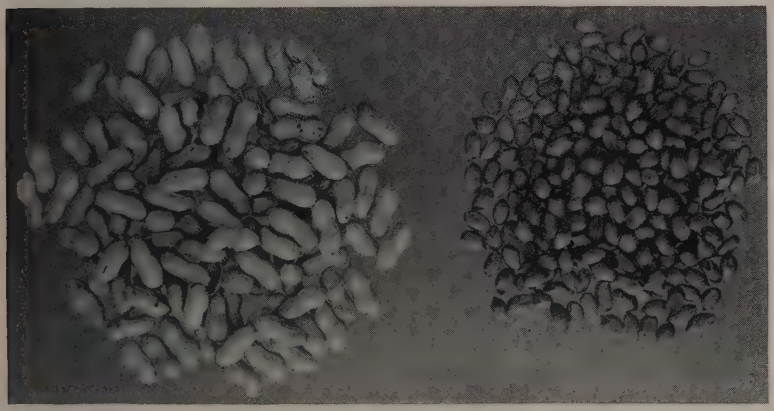

FIGURE 9.—Dixie Runner peanut, showing pod characters and shelled peanuts.

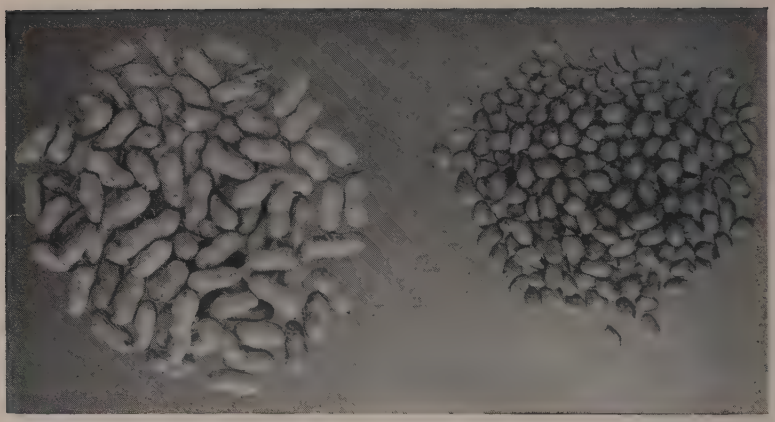

FIGURE 10.—North Carolina Runner 56–15 peanut, showing pod characters and shelled peanuts.

an upright habit of growth, but the branches often spread until the rows are completely closed. Under favorable conditions the vines reach a height of 26 inches or more and a spread of 36 inches. When grown on shallow soils with a scant supply of moisture, the plants are small, not over a foot high with about the same spread. The pods are mostly 2-seeded, some 1-seeded, and usually constricted between the seeds. Both ends of the pods are rounded; the shells are thin with conspicuous corrugations that are not deep. The seeds are globular to oval, tightly packed in the pods but seldom shouldered. The number of seeds ranges from 900 to 1,600 to the pound, depending on the variety and the season. The shelling percent ranges from 70 to 80, this, too, being determined by the variety and to a slight extent by the season.

The Spanish-type peanut is grown throughout the Peanut Belt, but chiefly in the Southeast and Southwest. Its principal weakness is lower yields than are common with the other types, but this can be partly overcome by planting in closer spaced rows and close spacing of the plants in the rows.

Dixie Spanish (Spanish 146)

Season about 120 days. A selection that has become important in the Southeast and the Southwest. Plants coarse and vigorous, upright in habit of growth, often over 30 inches tall, with a spread of about half the height. Branches become crooked and often entwined in and between the rows. Pods borne on pegs arising on the main stem and the side branches, most pods clustered around the base of the plant but some are several inches away; typically 2-seeded, rough, and often constricted between the seeds (fig. 11). Seeds oval, light flesh-colored, and packed tightly in the pods. Shelling percent about 72 to 78. Seed count about 1,200 to the pound. The quality of the products made from this variety is good to excellent.

Florence Spanish (Improved Spanish 2–B)

Season about 125 days. From a hill selection made at Florence, S. C., about 1918. Plants moderately coarse, vigorous and upright in habit of growth, often over 30 inches tall with an equal or greater spread. Branches become crooked

FIGURE 11.—Dixie Spanish peanut, showing pod characters and shelled peanuts.

and entwined in and between the rows. Pods borne on pegs arising on the central stem and the side branches, most pods clustered around the base of the plant, but some are several inches away; mostly 2-seeded; coarse, rough, and often constricted between the seeds (fig. 12). Seeds oval to oblong, light flesh-colored, and packed somewhat tightly in the pods. Shelling percent about 70 to 75. Seed count about 900 to the pound. The quality of the product made from this variety is excellent.

UNCLASSIFIED VARIETIES

Valencia

Early, season about 120 days. Plants coarse with heavy reddish stems and large foliage, quite tall, sometimes as much as 50 inches, with a spread of about 30 inches. Pods borne on pegs arising from the main stem and the side branches, most of them are clustered around the base of the plant but some are found several inches away; typically 3-seeded and smooth, with no constriction

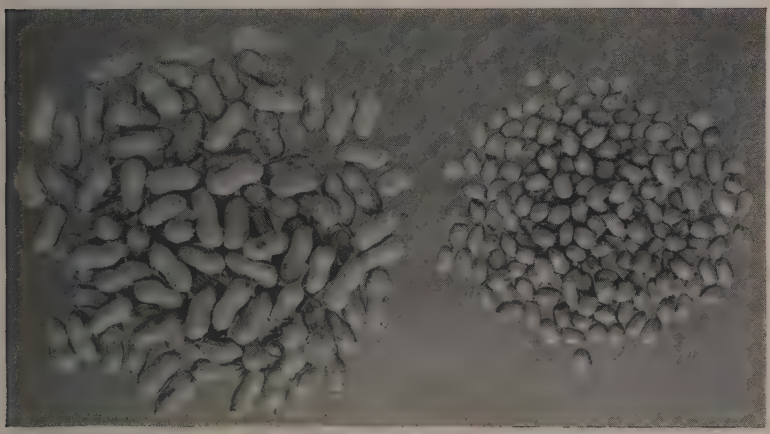

FIGURE 12.—Florence Spanish peanut (Improved Spanish 2–B), showing pod characters and shelled peanuts.

between the seeds. Seeds oval and tightly crowded into the pods. Two strains, one with flesh and the other with red seeds. Shelling percent about 70. Seed count about 1,200 to the pound. A light yielder but has excellent quality. An excellent sort to grow for home use.

Tennessee Red and Tennessee White

Alike, except for the color of the seed. Plants similar to Valencia, except stems are green to greenish brown and the pods are rough, irregular, and have a smaller proportion of kernels.

PEANUT SEED

Suitable climate, favorable soil, ample well-distributed moisture, seed of a high-yielding, high-quality variety that is adapted to the conditions, and proper cultural care are inseparable factors in producing a good crop of peanuts. These factors are so closely related that no one of them can be regarded as of most importance; however, seed is a vital one. High-vitality seed of an adapted variety will often outyield poor seed by one-fourth or more. Good seed can be obtained without enough additional cost to be important.

Federal, State, and industry research workers have produced high-quality, peanut hybrids, selections, and introductions, which, as yet, are responsible for only a small fraction of the commercial peanut crop. There has been a gap between the small-scale production of the plant breeder and the requirements of the commercial industry for seed. Total peanut seed requirements are very large. A 2,000,000-acre peanut crop with a seeding rate of 60 pounds of shelled seed per acre requires 120,000,000 pounds, or 60,000 tons, of carefully graded, high-quality peanuts for seed.

Heretofore the peanut growers have depended mainly on commercial shellers for peanut seed. Many shellers have made a practice of setting aside the best stock that they receive, usually the crops of certain excellent growers, for seed purposes. This practice is commendable as far as it goes, and has resulted in better yields and higher quality than would have been possible without it. It is not, however, the best way to handle seed.

The establishment of a peanut seed industry operated along the same general plan as those for corn, cotton, and other important crops is one of the greatest needs of the peanut industry. Such an industry would fill the gap between the breeding and selection work by State and Federal agencies and the needs of farmers for better seed. Hopeful progress is being made through the efforts of individual growers and seed certification agencies; commercial supplies of high-grade peanut seed are slowly becoming available in sufficient quantities to be of real commercial importance.

SELECTING THE SEED

Whether the peanut seed is grown by the farmer grower for his own use and for sale or by the farmer for himself alone, extreme care must be exercised; otherwise, the material may be no better than ordinary commercial stock. Planting stock for growing seed should be of known purity and performance. The land should not have been in peanuts the previous year because volunteer plants, particularly runner-types, may come up and contaminate the seed stock. Frequent

inspections should be made during the growing period and offtype, diseased, or otherwise objectionable plants removed.

Peanuts intended for seed should be harvested when a maximum number of pods have reached suitable maturity without loss of appreciable numbers through discoloration and decay. Daily inspection is desirable as harvesttime approaches, to determine the best time for harvesting. After removing the plants from the soil, all diseased, offtype, or poor-yielding hills should be removed and stacked separately for commercial use.

CURING THE SEED

Careful stacking on poles and slow curing are necessary in the production of damage-free, high-quality seed. With runner- and Virginia-type peanuts having characteristically heavy foliage, extreme care must be exercised to avoid stacking the plants before they have wilted sufficiently after digging or in such a manner that the peanuts will heat and mold in the stacks. On the other hand, damage may result from leaving the peanuts exposed too long to the hot sun. These dangers are acute in very hot weather and are especially likely to cause trouble in the gulf coast region with Virginia- and runner-type varieties. Information on the stacking of peanuts is given on page 45.

Quick curing of peanuts at relatively high temperatures reduces the viability and also causes excessive skinning and breaking during shelling and handling.

Peanuts intended for seed should be carefully picked. Hand picking is best, but this is practical only for small quantities. Machine picking is satisfactory, provided the picker is carefully cleaned before the work starts and is operated at a moderate speed to prevent breakage of the pods and to insure the proper removal of trash.

STORING THE SEED

Special care should be taken to protect seed from damage by insects, mice, or other pests, and from unfavorable storage conditions. Peanut seed should be relatively dry before being placed in storage, about 8 percent moisture or less for unshelled seed, 6 percent or less for shelled seed.

Peanut growers who require only a few hundred pounds of seed often use clean second-hand 50-gallon drums for storage. One end of the drum is cut out close to the rim and smoothed down; a square of plywood is laid on top of the drum as a cover. Ventilation may be provided by punching numerous small holes (as with a twentypenny spike) in the sides of the drum. The peanuts may be stored either in bulk or in sacks. Each drum will hold approximately 100 pounds of unshelled peanuts.

A satisfactory storage for larger quantities of peanut seed may be provided by building a suitable-sized enclosure or room in an unheated building by completely covering the floor, sides, door, and ceiling with ¼-inch wire mesh. To be effective, extreme care must be taken to make the enclosure mousetight. Even so, some mice are often carried into the room in the sacks of peanuts and they may cause considerable damage. The door should be provided with spring hinges and a lock, and extreme care must be exercised to keep it closed at all times.

Metal grain bins also provide excellent storage for unshelled peanuts, provided they are thoroughly dry and adequate precautions are taken to exclude mice and other enemies. Farm storage should not be depended on after late spring.

When providing for peanut-seed requirements, growers usually allow a bag (approximately 4 bushels) of farmers' stock for each acre to be planted. This provides an excellent guide to the amount of storage space required. Most varieties yield 65 to 75 percent seed, but trash, breakage while shelling, weather damage, and shrivels—all of which must be picked out—reduce the yield of planting stock to about half that of the original amount.

Peanut seed may be shelled several months before planting if kept under proper storage conditions; that is, dry and cool. Shelled peanut seed may be kept at about 5-percent moisture and at temperatures of 40° to 50° F. for 2 years without serious loss of germination.

SHELLING THE SEED

Peanut seed should be shelled in advance of the planting season when there is time to perform the work in an unhurried manner. Care should be taken to hold to a minimum the scratching, skinning, or damaging of the seed in any manner. Any form of injury to the seedcoat is harmful, and breaking or splitting the kernels renders them useless for seed. Hand shelling usually causes very little damage, but this method, too, may cause injury if the work is done with the so-called peanut popper or other hand device used to crack the shells. Machine shelling, however carefully done, causes some skinning and breakage. The extent of this damage is determined by the type, adjustment, and speed of the sheller, and by the variety, moisture content of the peanuts, and curing methods practiced.

Very dry peanuts, those having 4 to 5 percent moisture, are skinned and broken easily during shelling. With 7 to 8 percent moisture, the damage is usually less than half as much. Peanuts dried quickly at high temperatures in the sun, as in a windrow, or by an artificial drier, usually have excessively high skinning and breakage losses during shelling. Later treatment, particularly the temporary increase of moisture content before shelling, helps to reduce this damage but does not entirely overcome it.

The bulk of the peanuts used for seed are shelled either by the commercial shellers and cleaners using their regular equipment or by local seed shellers who do custom shelling for nearby growers. Local shellers handle relatively small lots of different varieties successively and there is great danger of the mixing of varieties, because of failure to clean the sheller completely between batches. Many of these machines are so built that thorough cleaning is impractical. For this reason the individual farm sheller for seed is advantageous.

Commercial equipment for shelling peanut seed is available in sizes ranging from those suitable for the individual farmer to others capable of handling quickly large quantities of peanuts. If operated at their normal speed and by using grids having the exact size of openings for the peanuts to be shelled, comparatively low skinning and breakage losses usually result. Most excessive damage while shelling is caused by the use of a grid that has too small openings or by the peanuts being very dry.

Plans for an electric- or a gasoline- motor-operated peanut sheller suitable for the requirements of large growers, groups of farmers, or small cooperatives are available from the Agricultural Engineering Research Branch, Plant Industry Station, Beltsville, Md. These shellers have a capacity up to several hundred pounds of shelled peanuts per day, and they can be made by any small machine shop. The machine produces seed that requires only nominal handpicking.

Directions for making a very simple, homemade sheller of moderate capacity may be had on request to the Horticultural Crops Research Branch, Plant Industry Station, Beltsville, Md. The sheller may be made in various sizes for operation by hand or by power, with capacities ranging from 30 to 40 pounds per hour upward. It is low in first cost and does effective work. Most parts except the perforated metal grids, or bars, may be improvised from odd materials. This sheller may or may not have provision for separating the shells, trash, pegs, and broken peanuts from the shelled peanuts. The shells may be blown out with a fan attached to the sheller, and the other material may be separated by using a series of hand screens or with a fanning mill.

With all shellers some handpicking to remove skinned, weather-damaged, or otherwise undesirable seeds is advisable. Very large, very small, and immature kernels, commonly known as peg seed, should be screened out and used for other purposes. The use of uniform-sized seed, having a range in size of not over $\frac{4}{64}$ inch in diameter, is desirable. Such seed makes it possible to adjust the planters so that uniform spacing is obtained. The possession of a set of screens with 2- to 3-inch slots that are $\frac{12}{64}$, $\frac{16}{64}$, $\frac{20}{64}$, $\frac{22}{64}$, $\frac{24}{64}$, and $\frac{28}{64}$ of an inch wide makes it an easy matter to screen out most of the broken peanuts and trash and to separate the seed into sizes. Handpicking is thereby reduced to the sorting out of weather-damaged and skinned seeds, unshelled pods, and foreign matter.

Shelled peanut seed should not be roughly handled. Much skinning and breakage may result from pouring seed from one metal container into another or into the metal hopper of the planter. The rapid shaking of the seed on sheller screens, hand screens, or in the fanning mill may cause skinning or scratching of the seedcoats. After planting, soil organisms may enter damaged seed and cause rotting of the seed. Bags used for peanut seed should be tied tightly so the seed cannot be jostled about.

TREATING SEED

Incomplete stand is the most common and perhaps the most important factor responsible for low yields of peanuts. Therefore, the grower should make every possible effort to obtain a full stand, including the use of sound seed stock and treating the shelled seed with an approved seed protectant before planting.

During the early days of the industry in the United States most peanuts were either hand-shelled or planted in the shell. Planting in the shell is wasteful, because the seed in the tip of the pod usually germinates first and frequently pushes the shell with the basal seed above the soil surface. Furthermore, unless soil moisture is abundant, germination in the shell is poor and a poor stand results. The great increase in acreage per farm and the decrease in available farm labor

during the last 30 years has made hand shelling of seed stock impractical. Growers have been forced to depend upon machine-shelled seed.

The peanut seedcoat contains a tanninlike substance that acts as an antioxidant to retard breakdown of the oil and also retards entrance of fungi and bacteria which cause decay of the seed. In machine shelling of peanuts, the seedcoat is scratched or broken on a very high percentage of the seed. If the scratch is deep, some oil is freed and exposed, soon becoming rancid, which reduces the viability of the seed. The break in the seedcoat also allows decay organisms to attack the exposed tissues and rapidly destroy the seed. Unless done with extreme care, machine shelling may reduce germination 25 to 75 percent, as compared with hand-shelled seed of the same lot. The machine-shelled seed, when treated with an acceptable fungicide, will usually give a slightly higher germination than the untreated hand-shelled seed. The improvement in stand is so striking that most peanut growers now insist upon treated seed for planting. Most machine shellers of peanuts for seed stock treat the seed at the time of shelling unless a customer insists upon nontreated seed.

To date (1954) only three materials have proved sufficiently effective under all conditions to merit recommendation for general use. These three, listed in order of effectiveness, are 2% Ceresan, Arasan, and Spergon. With sound seed that has not been severely damaged in shelling, the differences in effectiveness among the three may not be significant. When the seed stock has been weather damaged, when it has molded in the stack or in storage, or where shelling damage is severe, 2% Ceresan is significantly superior to any other material tested. On the other hand, with old seed or with seed planted immediately before a flooding rain, Spergon and Arasan may prove slightly superior to 2% Ceresan.

The recommended rate of application is 3 ounces to 100 pounds of shelled seed. There is a considerable margin of safety for all three materials, but 2% Ceresan at the rate of 6 ounces or more to the 100 pounds may cause injury to the seed. Neither Arasan nor Spergon will injure the seed even with the maximum amount that will adhere.

If a grower desires to treat his own seed, a drum-type seed treater or, for small lots, a can or jar with dusttight cover, may be used. Pour in about half the seed, add the required amount of dust, then pour in the rest of the seed, close the vessel, and turn slowly for 3 to 5 minutes or until all seeds are evenly coated.

Observations indicate that 2% Ceresan is also an effective protectant against insect and rodent damage. The other materials are not so effective, and additional measures may be necessary where insect infestation is severe in the storage room.

INOCULATING SEED

The inoculation of peanut seed with commercial inoculants has given variable and inconsistent results, especially on land where peanuts have been grown for some time. On new land, however, a good crop of inoculated peanuts will fix from the air about 42 pounds of nitrogen per acre. It would seem advisable, therefore, to recommend

inoculation of peanut seed when it is planted in soils that have never grown peanuts.

Care should be exercised in inoculating chemically treated peanut seed, because most chemicals in contact with the nodule bacteria will make the inoculant ineffective. If, on the other hand, an excess of humus inoculant is mixed with chemically treated seed and the planting is made within an hour, varying degrees of success have been reported.

PLANTING DISTANCES AND QUANTITY OF SEED REQUIRED

Variety, moisture supply, soil fertility, and the requirement that the same tools must be used without tedious adjustments for handling peanuts and the other crops grown on the same farm, practically determine the width of peanut rows and, to some extent, the spacing of the plants within the rows. With each set of soil and moisture conditions there is an optimum spacing, both for the width of the rows and the spacing of the plants within the rows. Deviations from these optimum spacings usually cause decreased yields. No hard and fast rule can be given for optimum spacing, because the best for one type of peanut differs among areas and even among nearby locations. Increases in yield of as much as 25 percent are often obtained by planting rows closer together, by placing the seeds closer together in the rows, or by both. These increases may more than compensate for the additional seed required and the trouble involved in adjusting the farm machinery for the narrow rows.

In the Southwest, with Spanish-type peanuts, rows 36 to 38 inches apart with 3-inch spacing of the plants in the rows have given the highest yields. In the Southeast the highest yields of Spanish and other upright-growing small sorts have been obtained from 3-inch spacing in rows with the rows 24 to 30 inches apart. In Virginia, with the large-seeded Virginia peanuts of the bunch type, 9-inch spacing in 24-inch rows and 6-inch spacing in 30-inch rows gave the highest yields. In North Carolina, with the same variety, tests indicated a marked increase in yields from decreasing the row width from 36 to 27 or 18 inches, but they indicated little effect of varying the spacing between the plants in the rows.

The approximate quantity of seed required to plant an acre is shown in table 1. The figures on the left in each pair in columns 3, 4, and 5 show the quantity of seed theoretically required for the smaller sized kernels; the right-hand figure shows the quantity required for the larger sized kernels. This table shows the importance of knowing the approximate size of the seed when providing the planting stock. In most cases the seed will be a combination of large and small seeds and the amount required will be between the figures given. More seed, usually 25 percent more than is theoretically required, should be provided and planted. Failure to plant enough seed is one of the most frequent causes of poor stands and lowered yields. Some seeds never germinate and many plants are destroyed by tillage tools and by enemies. Although good peanut seed is relatively costly, it pays to use enough to insure a good stand and a maximum yield.

Surplus fungicide-treated peanut seed should not be used for feeding to animals or for human consumption; it should be destroyed.

TABLE 1.—*Approximate quantity of shelled peanut seed required to plant 1 acre*

Type and variety of peanut	Spacing between seeds in the row	Approximate quantity of seed per acre required for rows separated by the distances shown		
		24 inches	30 inches	36 inches
Spanish types:	*Inches*	*Pounds*	*Pounds*	*Pounds*
Small Spanish, 1,600 to 1,200 seeds to pound	3	54–72	43–58	36–48
	4	40–54	32–43	27–36
	6	27–36	22–29	18–24
	8	20–27	16–21	13–18
Large Spanish, 1,100 to 900 seeds to pound	3	78–96	63–77	52–64
	4	59–72	47–58	39–48
	6	39–48	31–38	26–31
	8	29–36	24–29	19–24
Runner type:				
1,200 to 900 seeds to pound	4	54–72	43–58	36–48
	6	36–48	29–38	24–31
	8	27–36	22–29	18–24
	10	22–29	17–23	14–19
Virginia types:				
Virginia Bunch Large, 650 to 480 seeds to pound	6	66–96	53–76	44–63
	8	50–72	40–58	33–48
	10	40–58	32–46	26–38
Virginia Bunch Small, 800 to 600 seeds to pound	6	54–72	43–58	35–47
	8	40–54	32–43	27–37
	10	32–43	26–35	21–29
Holland Station Runner, 850 to 650 seeds to pound	6	51–66	41–53	33–44
	8	38–50	30–40	25–33
	10	30–40	24–32	20–26
Holland Jumbo, 700 to 450 seeds to pound	6	58–96	46–76	38–63
	8	43–72	35–58	28–48
	10	34–58	28–46	23–38

PLANTING PEANUTS

Weather and soil conditions determine the best time for planting peanuts. Early planting, consistent with settled weather and a well-warmed soil, is usually desirable. However, some growers make succession plantings of the same variety a few days apart for the purpose of increasing the length of the harvesting season. Because of variable weather and soil conditions, this plan does not always work. A better plan is to plant early-, medium-, and late-maturing varieties at one time. Differences of as much as 3 weeks may be often obtained in the harvesting dates between the early and late sorts.

Peanut seed is very sensitive to unfavorable conditions for germination, and it is wise to defer planting until a warm, moist seedbed is available. Planting dates vary with the geographical location. In southern Texas planting starts as early as March 1 and may continue until July 10. In Oklahoma planting takes place from May 15 to July 1. In the Southeast planting usually takes place about April 1 to 15. In Virginia most of the planting is done during early May. Planting dates must allow sufficient time for the crop to develop before too cool weather in autumn. Yields are greatly reduced when the planting date is very early or very late.

Several kinds of peanut planters are available that will plant the seed fairly uniformly and practically without injury. Those designed

FIGURE 13.—Single-row peanut planter.

primarily for planting peanuts or combination machines in which special attention has been given to the handling of peanut seed are to be preferred. Single-row planters drawn by a mule are commonly used for planting peanuts (fig. 13). Such a planter enables the operator to keep a constant watch on the movement of the seed, thereby insuring uniform seeding with no long skips. Moderate speed, such as is the habit of the unhurried mule, is of the utmost importance.

Two-row tractor-mounted planters are widely used. Some of these are standard 2-row planters equipped with special hoppers and plates for handling peanuts; in other cases, single-row planters are attached to a spacing bar on the tractor and supported by a cradle of heavily padded laths. The assembly is usually attached in such manner that the planters can be lifted at the ends of the rows. Too much speed and failure to watch the planting operation closely are common faults.

Rows marked out in advance of the planting are likely to dry out and they should be rerun before drilling the seed. Peanut seed should be covered to a depth of about 1½ inches on light-textured soil; a little less deep on heavier land. Slight firming of the soil over the seed is desirable, and the modern planting machines are fitted with a type of wheel that accomplishes this purpose. With favorable temperature and moisture conditions peanuts will come up in less than a week.

PROTECTING SEED FROM BIRDS AND RODENTS

In sections where crows, pigeons, squirrels, or other animals destroy the peanut seed after it is planted, it should first be spread on the floor or on a tarpaulin, sprinkled with a mixture of equal parts of

pine tar and kerosene, and stirred to distribute the mixture uniformly. It is neither necessary nor desirable that the material cover the entire seed, as a little will be effective.

PREEMERGENCE TREATMENT FOR WEEDS

The control of weeds,[1] particularly crabgrass, rough pigweed, annual morning-glory, and lambsquarters, during the early stages of growth of peanut plants is difficult and costly. A formulation of dinitro ortho secondary butylphenol used as a preemergence spray on the soil at a rate of 9 pounds per acre gives effective control of most weeds, including crabgrass, for several weeks with minimum peanut plant reaction and no reduction in stand or yield. Tests of the peanuts grown on the treated land showed no harmful effect on the quality. Other materials for treatment may prove to be equally, or more, effective. The dinitro material is being used to a limited extent commercially. Preemergence treatments can be made to a narrow strip over the row, instead of to the entire surface, thereby greatly reducing the amount of the chemical required. The spaces between the treated strips are cultivated in the usual manner.

CULTIVATION

The thorough preparation of the soil prior to planting is a distinct aid to the cultivation of the crop. The control of weeds is the most important benefit of cultivation, but cultivation that leaves the surface mellow and uneven also is an aid in retaining rainfall and lessens erosion. Cultivation that keeps the soil mellow around the plants as they spread and develop provides favorable conditions for the penetration of the pegs, and for the enlargement and development of the pods. It also reduces the likelihood of the loss of pods because of a hardened soil condition at harvest.

Two critical periods occur in the control of weeds in peanuts: first, when the plants are very small and, second, after the plants start setting fruit. Then cultivating tools must not be allowed to come close enough to the plants to interfere with the developing pegs bearing the pods that are buried an inch or two deep in the soil. Chemical weed control (above) may help with the weed-control problem during the early period of growth. Handwork with hoes is still the only method for the control of weeds close to the plants after pegging begins.

Considerable reduction in stand and yield are caused by covering young plants with soil during the early working of the crop. Buried plants seldom emerge.

Only tools that stir the surface of the soil very lightly should be used for the first few cultivations. Lightweight weeders fitted with plow handles and shafts and drawn by a mule are commonly used during the early stages of the growth of the plants. Because of the lightness of these weeders a careful operator can do good work with only minor injury to the young plants. Weeders of the same type are attached to tractors, and these too are capable of good work. Later, both the

[1] The weeds listed and their scientific names are: Crabgrass (*Digitaria sanguinalis*), rough pigweed (*Amaranthus retroflexus*), annual morning-glory (*Ipomoea purpurea*), and lambsquarters (*Chenopodium album*).

FIGURE 14.—Tractor with sweeps and weeder for cultivating peanuts.

weeder and a set of sweeps are attached to the tractor (fig. 14) or this type of outfit may be used from the start with the weeder covering the entire surface and with the sweeps covering the middles only. In figure 14 the peanuts were beginning to bloom; they were weed-free; and the weeder was to be removed before the next cultivation, with only the sweeps to be used for all later cultivations. From 15 to 20 acres per day can be handled by this type of outfit.

DISEASES AND THEIR CONTROL [2]

The peanut is subject to numerous diseases, but only a few of these are of sufficient importance to merit consideration by the grower. The grower should know the nature, cause, and control of the few serious diseases that occur every year and also those that are now serious in limited localities but are likely to spread to other regions. The disorders produced by nematodes are examples of the latter class.

SEEDLING DISEASES

Loss of seedlings from diseases is not usually a serious problem, but occasionally serious depletion of stand may occur.

Soil rot frequently attacks the stem at or just below the soil line, usually in localized spots in a field. The stem is usually completely decayed and the plant dies. This disease rarely kills a plant more than 6 weeks old.

Southern blight causes considerable reduction of stand in heavily infested fields. It can usually be recognized by the white, cottony mat of mold growth on the soil surface about the seedling.

Bacterial wilt occasionally appears in a field of peanuts and causes some loss of plants during the seedling stage, but in this country the loss is rarely serious. The peanut appears to be quite resistant to the strain of this organism that attacks tobacco.

[2] Scientific names of causal organisms are listed on p. 54.

FIGURE 15.—Peanut seedling damaged by sunburn: The tips of two primary branches are dead and the large stem lesion is partly covered with mold growth.

FIGURE 16.—Spanish peanut leaf infected with leaf spot: The two basal leaflets have turned yellow and are ready to drop off.

Heat canker appears to be the primary cause of the most serious losses during the seedling stage (fig. 15). On light sandy soils the stand is sometimes so reduced as to require replanting. As the peanut seedling emerges from the soil, the stem assumes an upright position with the leaflets folded together, affording very little shade for the stem. Radiant heat from the sun during a clear, bright afternoon is sufficient to burn the tender tissues of the stem during or shortly after emergence.

Sometimes enough tissue may collapse to cause the plant to topple over and die. More frequently only the west or southwest side of the stem is injured. The lesion may heal and the seedling develop into a normal, or nearly normal, plant. Often, however, the injured tissue becomes infected by one or more weakly parasitic fungi that may complete the destruction of the seedling at once or act more slowly and cause the so-called crown rot after the plants approach maturity.

Heat canker appears to be more serious on Southeastern Runner and Virginia-type varieties than on the Spanish varieties. The primary leaves of the Spanish seedlings are larger and unfold more quickly than those of the other two types, thus affording more shade and protection for the young stem.

Heat canker is always worse when the rows run in a north-south direction than when they run east-west. Running the rows in an east-west direction and close spacing of plants in the row afford more shade and protection from the afternoon sun. A roughened, slightly lumpy surface soil about the plants reflects less heat to the plants

than a flat surface. A smooth crust or finely divided dust should be avoided. Frequently damage may be reduced by going over the field with a weeder just before the seedlings emerge.

LEAF SPOT

Two fungi produce spots on leaves, stems, and pegs of peanuts (fig. 16).

The causal fungi overwinter on the diseased leaves and stems in the field. During the spring and early summer months, spores are developed by the fungi. These spores are spattered by raindrops or blown by wind and, falling upon a peanut leaf, they produce infection. With favorable, humid weather, even dews at night, spread of the disease is rapid. Spores of these fungi are carried long distances by air currents, and leaf spot is universally present in peanut fields late in the season. It always appears earliest in fields that have grown a crop of peanuts the previous year. Unless control measures are practiced, damage may be severe following such early infection of the plants.

As the disease progresses, the older leaves may show as many as 100 spots. The leaves turn yellow and drop off. Spots appear on the stems, weakening them. Finally, the plants die prematurely. As soon as the plants die, fungi and bacteria take over, rotting the pegs, roots, and stems. The dead stems and pegs quickly become brittle. There is no practical way to save a very large percentage of the nuts after the stems are dead. In severely infected peanuts, harvesting must be done before full maturity of the nuts.

Control.—Leaf spot can be effectively controlled by dusting with sulfur or with a copper-sulfur (10–90) mixture, or spraying with bordeaux mixture. The bordeaux spray gives better control of leaf spot than either of the dusts. However, spraying is practiced by very few growers because of the initial cost of spraying equipment and the difficulty of hauling large quantities of water to the fields. Also, the weight of the spray equipment and material causes considerable damage in the field.

To be effective, the dusting sulfur must be finely ground, 97 percent, to pass a 320-mesh screen. The applications must be properly timed. The first application should be made as soon as spots appear on the older leaves at the base of the plant, usually about 60 to 65 days after planting. If heavy rain occurs within 24 hours after the first application, dusting should be repeated within 3 days. Subsequent applications should be made at intervals of 10 to 14 days until 2 weeks before harvest. Thus the Spanish variety will require 3 to 4 applications; the Virginian and runner-type varieties will need 4.

The dusts and bordeaux spray also reduce the damage from leafhopper and from thrips.

The copper-sulfur dust is somewhat more effective in controlling leaf spot than the pure sulfur. Dusting Spanish peanuts with sulfur usually increases yields about 20 percent, or approximately 300 pounds of nuts per acre. On runner-type and Virginia peanuts the increase is usually somewhat greater. The yield increase from copper-sulfur mixture has averaged approximately 100 pounds per acre above that obtained with sulfur dust.

For dusting peanuts, a 4- or 8-row, power-driven duster is most

satisfactory. The dust should be blown downward through the plants with enough force to rebound from the soil and cover the undersurface of each leaflet. A bucket-type hood over each nozzle will help to direct the dust downward. The height of the nozzles should be regulated so that the hoods will just pass over the tallest plants.

SOUTHERN BLIGHT

Southern blight, often known as white mold, causes some losses throughout the season. It attacks the plants at or near the soil line, destroying the soft tissues of the bark and leaving only a fibrous mantle. The attacked branch or the entire plant may be killed (fig. 17). The pegs may be destroyed at any stage of development. The greatest loss is late in the season through decay of the pegs, which releases the nuts from the plants so that they are left in the soil at harvest. When the leaves drop as a result of leaf spot damage, they accumulate about the base of the plants, forming a mat that holds sufficient moisture for the fungus to grow rapidly along the row. Under such conditions 50 to 75 percent of the crop may be lost within a week, if rain occurs at this time. Knowing this, growers usually harvest peanuts from heavily infested fields before they are fully mature, thus incurring loss from light weight and lowered grade of the nuts. Southern blight may also cause losses in windrowed or stacked peanuts when humid weather follows digging, or even in threshed peanuts stored while moisture content is high. In the Spanish varieties oxalic acid, produced by the fungus, causes blue-black discoloration of the seedcoat (fig. 18). Although flavor and food value may not be reduced, such discolored seed are not permitted in No. 1 shelled stock. Some shellers have reported pickouts as high as 25 percent due to blue-black discoloration.

Control.—Southern blight is almost always present in cultivated fields throughout the Cotton Belt. It has been reported as attacking more than 200 wild and cultivated species of plants. Succulent plants, such as vegetables, are very susceptible to attack, while most of the grasses, including corn and small grains, are rarely attacked. It produces a great abundance of small sclerotial bodies about the size, shape, and color of turnip seed. These survive periods of drought or moderately cold weather and start into growth when weather conditions are favorable. These circumstances make effective control very difficult. The expense of complete soil sterilization is too great to be justified for most field crops, and lighter applications of fungicides have not proved very effective.

A considerable percentage of the sclerotia are destroyed during the winter by soil fungi and by soil-inhabiting animal life; but the number of live sclerotia in the soil is increased rapidly during summer as seedling or older plants are attacked. Peanut leaves and young stems, covered with soil during cultivation, are readily attacked by the fungus. Planting in deep furrows and moving soil to the plants in an effort to cover weeds and grass make the disease more destructive and may greatly reduce the final stand of plants in the field.

Crop rotation is effective in reducing losses in peanuts. Under continuous planting of peanuts the fungus rapidly builds up in the soil and losses may quickly become severe. Since soybean, cowpea, and most vegetable crops are very susceptible, peanuts should not be

FIGURE 17.—Southern blight of mature Spanish peanut plant. Note frayed pegs of lost pods toward the base of the plant.

planted immediately after these crops. Cotton and sweetpotatoes, while not particularly susceptible to attack, leave much trash that forms an excellent medium for growth and multiplication of the fungus. Whenever possible, peanuts should follow corn or small grain, if experience has shown white mold to be abundant in a field.

PEG ROTS

So long as a peg (gynophore) or the attached pod is actively growing it is very resistant to attack by ordinary soil organisms. How-

FIGURE 18.—Blue-black discoloration on seedcoats of Spanish peanuts.

ever, the two fungi that cause southern blight and soil rot attack living, immature pegs. Southern blight frequently attacks the young pegs as they enter the soil, killing and decaying the tender growing tip and ovary. As the peanuts approach maturity, the foliage of plants bearing a good crop of nuts fades to a lighter green color. At this stage, growers frequently notice single plants or groups of plants that have retained the full green color and vigor. When such green plants are pulled they have few or no nuts attached; only the frayed stubs of pegs remain.

During rainy periods in late summer, soil rot may overrun the entire peanut plant. The aboveground parts become covered with the powdery, white spore-forming layer of the fungi, which does not appear to damage the underlying tissues. However, the vegetative mycelium in the soil does attack pegs and pods, both mature and immature, though the damage is rarely so severe as from southern blight.

After the pod and seed are mature, the peg quickly dies and is then subject to decay by numerous nonparasitic, soil-inhabiting fungi and bacteria. Should the soil become moist and remain so for a week after the nuts are mature the pegs become so weakened that they break when the plant is lifted, leaving the nuts in the soil. Frequently all fully matured nuts are thus lost in harvesting.

CONTROL.—So far no satisfactory means for protecting peanuts from peg rots has been developed. Dusting for leaf spot control helps the plant to retain its leaves and to continue its growth and vigor. Under these circumstances the pegs and pods retain life longer and are not so soon susceptible to nonparasitic organisms of decay.

POD AND SEED DECAY

Peanut pods, like the pegs, are quite resistant to attack by most soil-inhabiting fungi as long as the shell tissue is living, but they are susceptible to southern blight and soil-rot fungi. The effects of these two fungi have been discussed in previous sections.

As the seed mature, most of the nutrients in the shell tissues are moved into the seed, and the shell finally becomes a porous corky mass of dead tissue surrounding and protecting the seed. In this condition the shells appear to be readily penetrated by soil fungi; but, because of the corklike nature of the tissues and low nutrient content, they still offer considerable protection for the seed, and comparatively little decay occurs in the soil except by such organisms as cause southern

blight and soil rot. These obtain nourishment from the stem, pass down through the pegs, and gain entrance to the interior of the pod. After the plants die from disease or overmaturity and masses of dead leaves accumulate on the soil, growth of fungi becomes more accelerated and pod and seed decay more rapid.

BLACK POD

Black pod is a type of damage that frequently causes alarm among growers. It is quite common in the varieties having large pods and seeds, such as Virginia Bunch Large, Virginia Runner, and Tennessee Red. It occurs less frequently in the Southeastern runner-type and rarely in small-seeded strains of the Spanish type. Frequently a large percentage of the pods are found discolored when removed from the soil. The discolored pods usually contain only dead, shriveled seed or collapsed seedcoats.

The primary causes of the condition are drought and deficiency of calcium in the soil. Lack of calcium causes formation of weak cell walls in the rapidly growing pods and seeds. Drought, occurring during an early stage of seed development, causes collapse of the seed and of the pod tissues. Various soil fungi may then attack the dead pod tissues, causing discoloration.

With pods approaching maturity when the drought conditions occur, the pod tissues do not collapse or become discolored. The seeds do not collapse but, on maturity, may show one or more faded, whitish spots, indicating points where the seedcoat tissues have collapsed. All gradations between the two types of injury may be found in a single lot of peanuts.

These conditions are associated with calcium deficiency in the soil where the pods are developing. An application of gypsum 6 to 8 weeks after planting will usually prevent this type of damage.

CONCEALED DAMAGE IN SEED

Concealed damage is an early stage of seed decay that occurs principally after harvest in the stock or windrow or even in storage after picking. Peanuts harvested during humid weather and stacked without sufficient wilting or while damp from rain or dew, or are windrowed, quickly become covered with moldy fungus growth. The fungus growth passes through the pegs and through the point of seed attachment (hilum) into the interior of the seed. Here the fungi continue development in the space between the two cotyledons (fig. 19) and soon discolor the inner surface of the cotyledons before any damage is noticeable on the outer surface of the seed.

During humid weather the damage is usually much greater in windrows than in stacked peanuts, unless the stacks are poorly constructed and do not shed rain.

When peanuts are picked and stored with a moisture content above about 9 percent, mold growth continues in the bins. Concealed damage and complete decay of the seed may develop even more rapidly than before picking.

There is considerable difference among peanut varieties in regard to occurrence of the concealed, or internal, type of seed decay. It is most serious in runner types grown in the lower South and harvested

FIGURE 19.—Concealed damage in Southeastern Runner seed: Each seed in upper four rows split to show normal appearance of seedcoat and more or less discoloration and decay on the inner surface of the cotyledons; bottom row, sound seed.

while summer temperatures are still prevalent, especially if humidity is high during harvesting and curing. Virginia-type peanuts harvested under these conditions are also severely damaged, while concealed damage occurs very rarely in the Spanish varieties. Certain strains of small-seeded peanuts, both runner and bunch types, are also comparatively free of concealed damage. In these the decay-producing organisms develop from the seed surface and damage to the seedcoat is visible even before the fungi have damaged the cotyledons. The exact explanation of this difference in varietal susceptibility is not yet available.

The most susceptible varieties, when grown in the northern part of

the Peanut Belt and harvested during cooler weather of late fall, do not show any appreciable amount of concealed damage. Low temperature and more thorough wilting and careful stacking appear to be the explanation.

Control.—The first suggestion for the control of concealed damage is later planting of runner-type and Virginia-type peanuts in the Southeastern States, so that they may be harvested and cured during cooler weather and after the tropical storm period of September. At present there is inadequate information on relative yields of early- and late-planted peanuts in this area.

A second means of reducing loss is greater care in harvesting and curing, particularly with regard to the degree of wilting and more careful stacking. Stack poles with cross strips so low that the ends of the vines touch the soil do not allow good circulation of air through the stacks, and curing is slow. Stacks that do not shed water may allow more damage than in windrowed peanuts. Nuts exposed on the surface of a stack usually suffer considerable weather damage.

ROOT-KNOT NEMATODE [3]

The peanut has been generally considered very resistant to the common root-knot nematode, so much so that it has been, and still is, recommended for growing in rotations with tobacco on nematode-infested soil. In 1931 root knot was reported on peanuts in North Carolina, and since that time this disease has been doing considerable damage in scattered localities in both North Carolina and Virginia. Since 1946 it has been found causing severe damage to peanuts in certain scattered fields in southeastern Alabama. Through a survey in 1949 it was found on peanuts in 16 counties in southwestern Georgia adjoining the infested area of Alabama and Florida.

There are two species of root-knot nematodes that infest peanuts. The species usually found in Florida, Alabama, and Georgia produces massive knots on roots, pegs, and pods of peanuts (fig. 20). The plants become yellow and stunted. In severely infested fields, the crop may be so reduced as to make harvesting unprofitable. The species found in Virginia and North Carolina does not produce such massive knots as the other species, and the crop loss appears to be less severe (fig. 21).

Control.—Both species of root-knot nematode are at present rather limited in distribution, and every possible effort should be made to avoid infesting new areas and clean fields. Since both infest the peanut pegs and pods, the shells from infested lots should be burned. Shipments of infested, unshelled peanuts may be the means of spreading the nematodes to other areas. Fields known to be infested with these nematodes should not be planted to peanuts. Since the host range is still not clearly known, definite rotation systems cannot be recommended at this time. It appears that neither of the two species attacks cotton.

Results from a single test in Virginia indicate that row fumigation of nematode-infested soil may produce an increased yield of approximately 20 percent.

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[3] The scientific names of nematodes are found on p. 54.

FIGURE 20.—Spanish-type peanut from Baker County, Ga., showing massive galls produced by one species of nematodes on the roots, stems, and pods.

MEADOW NEMATODE

During the past 25 years lots of peanuts with dark-brown or black spots on the shells (fig. 22) have been observed. It was not until 1949 that the disease with its associated symptoms was observed in the field and its true cause determined.

When examined under the microscope the spongy shell tissue under the discolored spot is found to be partly or completely destroyed and large numbers of nematodes are often present. The young rootlets on plants producing discolored nuts are blackened and dead, and many young pegs have discolored infested spots, usually in the tender, rapidly growing area near the tip. The root nodules, produced by nitrogen-fixing bacteria, are frequently destroyed.

Destruction of nodules and of young rootlets, potential location for nodules, apparently lowers the nitrogen-gathering power of the plants to such an extent that the plants may become yellowed and stunted, similar to plants suffering from nitrogen starvation.

This group of nematodes is widely distributed throughout the Southeast. It attacks the roots of cotton, peanuts, and many other crops. Very little is known as to the host range of the various species of meadow nematodes or the amount of damage they produce.

Control.—No practical methods of control have been found. The nematodes and their eggs may remain alive for several months in the cured peanut shells. The practice of using shells and other refuse from the shelling plants as a mulch for shrubbery and other plants

Figure 21.—Virginia bunch-type peanut from Pitt County, N. C., showing numerous small galls produced by a species of root-knot nematode on the roots.

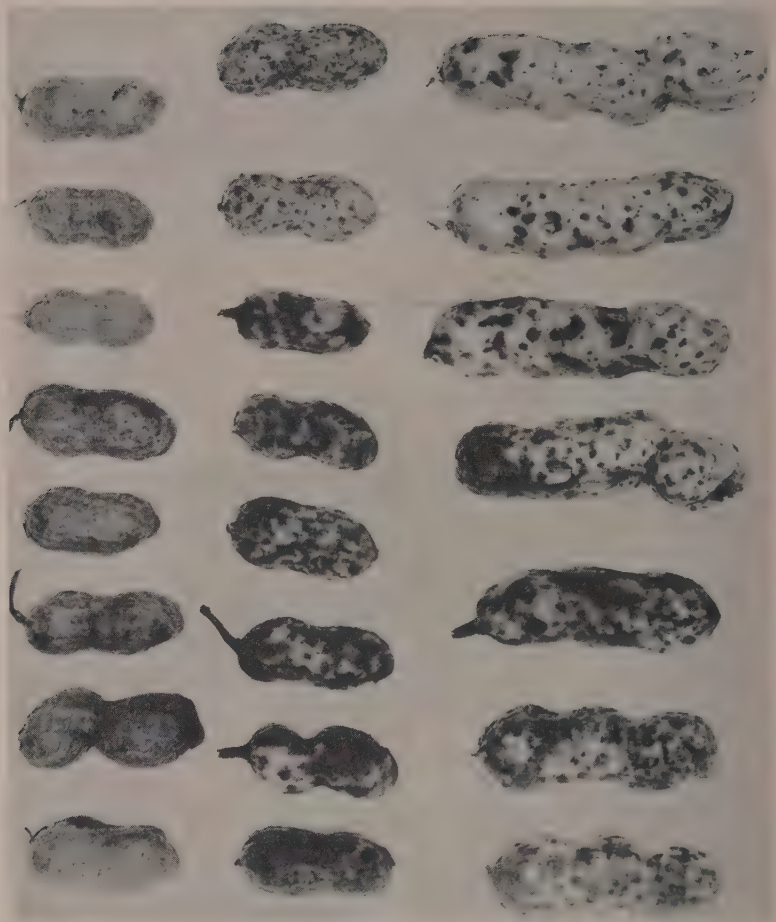

FIGURE 22.—Peanut pods, showing various degrees of spotting by meadow nematodes: Left column, normal pods of Spanish peanuts; middle column, Spanish type spotted by meadow nematodes; right column, pods of Valencia type infested with meadow nematodes.

or spreading them on fields may cause heavy infestation with these root-destroying nematodes. The shells should be thoroughly steamed or fumigated before such use is made of them.

STING NEMATODE

The sting nematode is a very serious pest of peanuts in Virginia and is known to be widely distributed throughout the peanut growing region. It is associated with severe stunting and loss of yield. This nematode, in contrast to the root-knot and meadow nematodes, is an ectoparasite; that is, it feeds on the roots from the outside and will not be found in the roots but in the surrounding soil.

CONTROL.—Good control of the sting nematode and correction of the associated stunting has been obtained by soil fumigation. As yet not enough is known of the habits of this species to warrant recommendation for control by crop rotation.

INSECT ENEMIES AND THEIR CONTROL [4]

POTATO LEAFHOPPER

The potato leafhopper may cause severe injury to peanut foliage. The insects pierce the leaves and leafstalks of the young plants and suck the juices from them. The tips and margins appear burned and the leaves become yellow and the plants dwarfed, with consequent decrease in yields of the forage and peanuts.

The potato leafhopper is a wedge-shaped insect, pale greenish yellow, about ⅛ inch long, and very active. The egg is placed within the stems or larger veins of the leaves, and in the summer it usually hatches within 6 to 9 days. The young are nearly white at first, but they become green as they feed. They develop wings when full grown.

This leafhopper prefers the potato as food and becomes very abundant on this plant when the weather is favorable. Peanuts should therefore not be planted near an early crop of potatoes.

CONTROL.—In Virginia, satisfactory control of the potato leafhopper, and also of the peanut leaf spot disease, may be obtained with a dust containing 1 percent of DDT and 90 percent of sulfur. Three applications 3 weeks apart should be made, beginning about July 10, with the first application at the rate of 20 pounds per acre and the later ones at 25 pounds.

TOBACCO THRIPS

The tobacco thrips causes widespread diseaselike injury to peanut leaves (fig. 23), which delays the growth of seedlings by 2 to 3 weeks. Injury is most severe in dry weather. Growers often refer to the thrips injury as pouts, because the plants are said to "pout" until they begin to bloom. Injured terminal buds of very small seedlings may become black as if they had been burned. Much of the feeding by this insect, however, is done on the upper surface of the leaflets before they unfold, and is not apparent until they open up later. Maturity of the peanut crop may be delayed, but if ample moisture and plant food are available the yield is not significantly reduced.

The tobacco thrips is a dark-brown or black insect, so small that it is not easily seen. It moves rapidly. The young stages are yellow and hatch from eggs placed within the tissues of the peanut leaflets. Several generations develop each season.

CONTROL.—Peanuts grown on soils of low fertility should be treated with an insecticide as soon as thrips injury appears on the young plants and again about 10 days later. Apply a 3-percent DDT dust at the rate of 10 pounds per acre or a DDT-emulsion spray prepared by mixing 3 pints of a 25-percent emulsifiable concentrate in 5 gallons of water.

[4] The scientific names of insects attacking peanuts are found on p. 54.

FIGURE 23.—Peanut leaves injured by the tobacco thrips. Several of the leaflets at the right have been killed and are shriveled and blackened.

SOUTHERN CORN ROOTWORM

The southern corn rootworm feeds on the underground parts of the peanut plants. The larvae cut through the pods and feed on the kernels (fig. 24). They also may destroy many of the pegs soon after they enter the ground and thus prevent them from producing nuts. Peanuts grown in heavy, poorly drained soil or in fields where a leguminous winter cover crop has been plowed under are attacked most severely by this insect. More than 80 percent of the pods are sometimes damaged.

The adult, also known as the spotted cucumber beetle, is a yellowish-green beetle about $\frac{1}{4}$ inch long, with black head and 12 conspicuous black spots on the wing covers. The insect passes the winter in this stage. In the spring the eggs are laid in the ground, and the young larvae hatching from them attack the peanut plant. When full grown the larva is $\frac{1}{2}$ to $\frac{5}{8}$ inch long and has a wrinkled yellowish-white body and a brown head.

CONTROL.—The southern corn rootworm can be controlled with one soil application of aldrin, heptachlor, or toxaphene. The insecticides should be used in one of the following ways: Apply a free-flowing 5-percent aldrin or heptachlor dust with a crop duster at the rate of 40 pounds per acre; or apply 250 pounds of 10-percent granulated toxaphene or 200 pounds of 1-percent granulated aldrin or heptachlor per acre with a fertilizer distributor or lime spreader; or apply 100 pounds of 2-percent granulated aldrin or heptachlor with fertilizer side-dressing attachments.

Apply an aldrin-fertilizer mixture with a fertilizer distributor. Such mixtures are now on the market. Follow the directions given on the bag concerning the amount to use.

Apply the insecticide evenly to the soil *before* you cultivate the

peanuts for the first time and not later than June 15. Cultivate as soon as possible after the application, in order to prevent loss in effectiveness of the insecticide.

VELVETBEAN CATERPILLAR

Velvetbean caterpillars feed rapidly on the peanut plants and when abundant may completely strip them within a few days. The full-grown worm is about $1\frac{1}{2}$ inches long, greenish or blackish, with several narrow light stripes along the back and sides. It is very active and when disturbed will spring into the air, wriggling violently.

This insect probably does not survive the winter in continental United States. The moths fly northward from the Tropics each summer and lay their eggs on peanut and other favored food plants. These eggs hatch into the destructive caterpillars. In the Southern States the insect may have as many as three generations a year.

Control.—Prompt control of the velvetbean caterpillar is important. Within a few days after the eggs hatch, apply a 3- or 5-percent DDT dust at the rate of 20 pounds or a 10-percent toxaphene dust at 15 pounds per acre, if the treated crop is not to be used for forage. Use a 5-percent methoxychlor dust if the peanut vines are to be fed to animals. A second insecticide application about 10 days later may be necessary to destroy newly hatched caterpillars. Any

Figure 24.—A peanut pod cut open to show a southern corn rootworm.

of these dusts can be added to sulfur applied to peanut plants to control leaf spot disease.

FALL ARMYWORM AND CORN EARWORM

The fall armyworm and the corn earworm frequently cause damage to peanut foliage similar to that caused by the velvetbean caterpillar. The fall armyworm prefers to feed on grasses and attacks peanuts in hordes only in grassy fields. Under such conditions an application of a 20-percent toxaphene dust at the rate of 10 pounds per acre is recommended. A 3-percent DDT dust applied at 25 pounds per acre is suggested for the control of the corn earworm. No significant injury to peanuts by either of these insects has been observed where control measures have been applied against the potato leafhopper (see p. 37).

WHITE-FRINGED BEETLES

In some parts of the South grubs of white-fringed beetles frequently feed on the roots of peanut plants. When feeding is severe, the plants turn yellow, wilt, and die.

There are three species and several races of these beetles. They emerge from the soil in the summer and attach their eggs in small masses to plant stems, sticks, or pebbles near the soil surface. In warm, moist weather the eggs hatch in about 2 weeks, and the grubs immediately enter the soil, where they remain until full grown. There is usually one generation a year.

CONTROL.—White-fringed beetles can be suppressed by planting peanuts on the same land only once in 3 or 4 years, and a succession of oats, corn, and cotton in the intervening years. Field infestation of the grubs can be controlled for several years by mixing 10 pounds of DDT per acre into the upper 3 or 4 inches of soil when preparing the land for the crop. Excellent protection of the growing crop has been obtained with DDT applied in the drill row at the rate of 2½ to 5 pounds per acre annually for 3 or 4 years, or until 10 to 15 pounds have been applied per acre.

Precautions: Most insecticides are poisons. Handle them with care and keep them away from irresponsible persons and from domestic animals. Follow all directions on the containers.

Do not feed peanut forage treated with insecticides to dairy animals or to animals being finished for slaughter.

HARVESTING AND CURING

The yield of No. 1 shelled peanuts may be greatly affected by a difference of only a few days in the date of harvesting. If the harvesting is too early, many of the pods will be immature with a large proportion of shriveled kernels; if too late, many of the pods may be lost through disease and unfavorable weather conditions. Harvesting a few days too early or a few days too late may cause losses in good peanuts of as much as one-fourth the crop. The Spanish varieties and Valencia, Tennessee White, and Tennessee Red usually require about 120 days from the best date they are planted until they reach the best condition for harvesting. Virginia Bunch varieties require about 130 days; Virginia runner-type varieties and the true

runners require about 140 days or more. Very early planting, before the soil is warm and the weather settled, increases the time required for peanuts to reach the best stage of maturity for harvesting. Dusting or spraying for insect and disease control usually extends the growing period by several days.

As peanuts approach harvesttime they should be inspected every day or two for the purpose of determining just the right date for the harvest. The type and variety of the crop and the number of days that have elapsed since they were planted are rough guides for determining when the crop should be harvested. The appearance of the plants is another guide. If they have ceased to grow rapidly and have assumed a yellowish cast, the harvest season is near. An examination of the pods is the best guide.

If the majority of the kernels are full-grown and are assuming their mature color and the insides of the shell have begun to color and show darkened veins, it can be assumed that the crop is ready to harvest. At best, some pods are likely to be overmature and some immature. Both the runners and the Virginia runners, or other sorts that bear the pods for several inches from the base of the plant, nearly always have a considerable number of partly developed pods; but to wait for these to reach maturity would mean the loss of many of the older ones. Therefore it is necessary to choose a time for harvesting when the largest number of the pods will be in prime condition.

Peanuts should be harvested during clear weather when the soil is sufficiently dry that it will not stick to the stems and pods. Peanut hay is a valuable feed, particularly when it is free from soil. Bright pods free from soil have a higher value than those that are dusty and discolored. Very dry crusted soil may cause many of the pods to break off and be lost.

METHODS OF HARVESTING

Peanuts should be loosened from the soil by means of a sharp implement that will cut the main root below the surface. This leaves most of the root system, bearing the nitrogen nodules, in the soil. Diggers fitted with sharpened plates that slide along below the surface do this quite effectively, but the problem of keeping the tools sufficiently sharp to cut the plants instead of pulling top and roots from the soil usually defeats this plan. Diggers that lift the plants a few inches after they are cut loose and then deposit them on the surface with the peanuts next to the soil, where they are protected from the sun and from the dew, should they remain on the row overnight, are to be preferred.

A plow-type digger fitted with a share that has been sharpened to a knife edge does good work, but it requires more hand labor for lifting and straightening the plants than is required for some of the more elaborate tools (fig. 25).

A simple effective 2-horse digger with a V-shaped sharpened blade carried on a frame mounted on wheels can be adjusted for depth (fig. 26). It is set with the cutting edge of the blade lower than the back, thereby lifting the plants after they are cut loose. However, this tool does not completely remove the plants from the soil and it requires considerable handwork with forks to do this.

A digger equipped with a sharpened blade, similar to that shown in

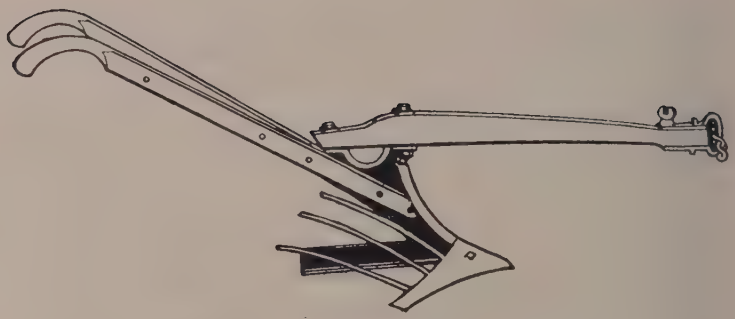

FIGURE 25.—Plow type of peanut digger.

figure 26, has geared, notched plates mounted on shafts driven by sprocket chains from the wheels (fig. 27). This geared shaking device elevates the vines and discharges them practically soil-free on top of the rows with most of the peanuts down. Very little hand shaking is required before stacking. This model is adapted primarily for tractor operation.

Figure 28 shows a pair of harvesting blades attached to a farm tractor. The chief objection to this device is its failure to raise the plants clear of the soil so that it must be followed by considerable handwork.

CURING

When harvested, peanuts usually contain about 40 percent moisture. This must be reduced to less than 10 percent before the peanuts can be safely stored. The safe figure depends on the bulk and the storage methods employed. The reduction of moisture content to a safe figure for storage or sale is a matter of great importance, for much of the value of a fine crop can be lost during this critical period.

Drying, or curing, is usually accomplished either by stacking or by bunching or windrowing on the surface of the soil. During recent years artificial drying has been studied extensively, but it has not been entirely successful.

The drying of peanuts in windrows is extensively practiced in the Southwest where there is little danger of serious rain damage in most years. In the Southeast, rain, dew, and exposure to the hot sun are especially unfavorable to the production of high-grade peanuts by windrow curing. Unfortunately, discolored shells and injury to the quality of the seeds usually result from windrow curing. Excessive skinning and breakage during shelling and handling are characteristic of this method of curing. A considerable proportion of the windrowed crop thus falls into the No. 2 class, with serious financial loss.

Saving of labor is an important advantage of windrow curing. After the peanuts are loosened from the soil a side-delivery rake is often used to combine several rows into a windrow. However, the windrowed peanuts are subject to weather damage and the rake mixes trash, stones, and lumps of soil with the plants. After curing, the peanuts are hauled to a picker or a combine, or a picker may be drawn along the windrows picking the peanuts and discharging the vines on the land.

Farmers' stock peanuts are subject to premiums and discounts of $3 to $3.50 per ton for each 1-percent sound mature seed content above or below the base grade. It seldom pays to employ short-cut curing methods that may cause a great reduction in the value of the crop.

Field curing in stacks is the best method of drying the crop to produce high-quality peanuts, but it too has many disadvantages. The

FIGURE 26.—A 2-horse digger: *A*, Details of construction; *B*, at work.

FIGURE 27.—Peanut digger with geared shaking device.

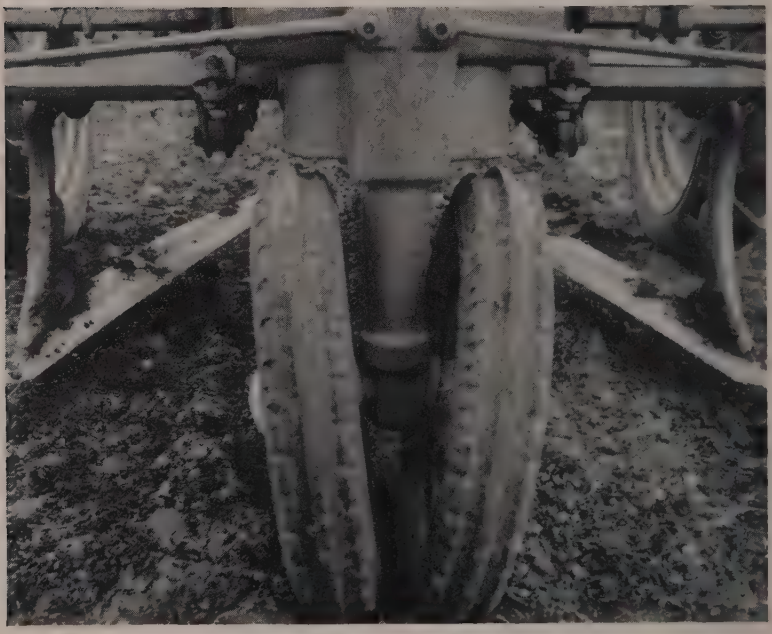

FIGURE 28.—Harvesting blades attached to farm tractor.

amount of labor required to stack peanuts properly is very large. Unless the work is carefully done, with the vines well wilted before stacking, there will be danger of spoilage in the stacks. Heavy-vined running varieties, such as the Virginia and the runner peanuts, are particularly subject to spoilage in hot weather if the vines are not thoroughly wilted before stacking. Even with proper stacking there is still danger from weather damage by heavy rains and winds. Damage to the peanuts in the stacks by squirrels, rats, and birds is another hazard of the field curing of the crop. The general use of stack covers would greatly reduce bird and weather damage.

Stack poles should be smooth, 7 to 8 feet long, and pointed at the upper end. Saplings about 2 inches in diameter, from which all the bark and twigs have been removed, are satisfactory. Sawed stakes about 2 by 2 inches are widely used. These are commonly obtained as a byproduct of sawing railroad ties. They may be used for several seasons if stored under shelter when they are not in use in the field. The treatment of the lower portion of the poles with a wood preservative will greatly lengthen their life.

Two crosspieces, usually 1 by 3 inches by 14 to 18 inches long, should be nailed to the pole about 15 inches from the surface of the soil. It it best to do this before the poles are set, allowing for the depth the pole is to be set in the ground. Smooth poles make it possible to lift the stack from the ground at picking time and to pull the pole from the stack at the picker.

Metal poles in the form of tubes with the crosspieces permanently attached in such a manner that they may be folded for storage are coming into general use.

From 15 to 30 stack poles are required for each acre. Many growers distribute the stack poles, set them, and harvest one row of peanuts at each stack row a few days before the main harvest. The peanuts from this harvested row are used to start each stack. This is done by winding a few plants around the pole above the crosspieces to serve as a foundation for the main part of the stack. This is very important, because it keeps the stack from settling too close to the soil, thereby cutting off free ventilation.

The poles may be set by hand, using a post-hole digger. Because of the small size of the poles and the fact that they are set only about 18 inches deep, the amount of labor required is not very great. The work may be done rapidly and economically by using a power auger attached to a tractor. A trailer bearing the poles is usually attached to the tractor, making it possible to dig the holes and set the poles at one trip per stack row.

The peanuts from the dozen or more rows to be stacked in one stack row are bunched and brought to each stack site with pitchforks. A better job of stacking can be done by hand, but stacking with forks supplemented by some handwork is the usual practice. With care in keeping the vines straight with the tops all in one direction, a very good job of stacking can be done with forks.

Peanut stacks should be slender, not more than 36 inches in diameter. The plants should be arranged with the peanuts around the pole and the vines sloping downward. This helps to shed water and aids in keeping the diameter of the stack as small as desired. Free circulation of air around the base of the stack is necessary. This requires that the diameter of the stack at the bottom be small—never so large that the

FIGURE 29.—Three steps in the construction of a peanut stack.

vines will overhang the crosspieces to the extent that they shut off the movement of the air to the center of the stack. As the building of the stack proceeds it may be widened a little and then drawn in as with the construction of a haystack. Topping each stack with hay, grass, weeds, or a stack cover reduces damage by birds, squirrels, and the weather. The various steps in the construction of a peanut stack are shown in figure 29.

Peanuts dry rather slowly in the stacks; from 4 to 6 weeks are usually required to dry the pods to a moisture content of 7 to 8 percent. Most farmers move the peanuts directly from the picker to the market; therefore they should be dried, before picking, to a moisture content sufficiently low so that there will be no spoilage in storage. There are price penalties for too high moisture. Most growers are able to estimate closely the moisture content of peanuts by feel; however, many peanut buyers are equipped with apparatus for the quick determination of the moisture of a lot of peanuts. It is best to wait until it is certain that the peanuts are dry before picking, because dry peanuts are cleaned better, and they may be bagged at the picker and marketed or stored directly without further drying.

SAVING PEANUTS LOST WHILE HARVESTING

Considerable quantities of peanuts are sometimes lost in the soil when harvesting. It is a common custom to turn hogs into the fields after the peanuts have been picked to feed on those remaining in the soil. Sometimes, particularly when southern blight has been severe, a large proportion of the crop may have been left in the soil. Under these conditions it usually pays to follow this practice, but the practice interferes with the prompt seeding of the ground to a cover crop. Unless a considerable proportion of the crop has been lost when harvesting, it usually pays to sow the land to a cover crop as soon as the peanuts have been harvested, without waiting to salvage the peanuts left in the soil.

PICKING

The removal of the peanuts from the plants, with a minimum of trash, is one of the most important parts of peanut production. The value of a fine, properly cured crop of peanuts can be greatly lessened by careless picking and cleaning. Breakage of the pods and failure to remove most of the roots, broken stems, stones, and similar matter may easily reduce the sale price by many dollars per ton. Only equipment that will do the work properly should be used. Improper speed, a broken screen, a missing stemmer part, or wrong adjustment of the parts of the picker or combine may cause broken shells or increase the amount of trash left in the peanuts. Irregular feeding and crowding beyond the normal capacity of the machine are common causes of poorly cleaned and damaged peanuts.

Three goals for the peanut grower in picking or threshing peanuts are (1) to remove all dirt, trash, and other foreign material; (2) to avoid breaking the peanuts; and (3) to recover the largest possible percentage of nuts.

WITH PORTABLE PICKERS

Two types of portable pickers are available for removing peanuts from the vines and cleaning them for market. One is provided with a heavy metal mesh over which the peanuts are drawn in such a manner that they are pulled from the vines. The other is provided with one or more cylinders that operate in the same manner as a grain thresher. Each type is provided with a blower for blowing out the light trash; screens for separating the peanuts from the stems, roots, stones, and other foreign matter; saws for removing the pegs from the pods; and other devices for the complete picking and cleaning of the peanuts.

Peanut pickers are mounted on a trailer type of chassis, usually rubber-tired. They may have an engine mounted as an integral part of the machine or they may be fitted with a belt pully for a separate power source. Being easily moved from place to place the picking outfits are usually moved frequently to avoid congestion at the picker and hauling the stacks too far.

Pickers are not usually equipped with means for removing the hay from the discharge end of the machine. As a result the hay soon accumulates to the point that it cannot be easily kept away by hand and it is easier to move to a new location than to move the hay out of the way.

When setting a picker, it is always necessary to study the direction of the wind. The outfit should be set in such a way that the dust and trash will be blown away from the side of the machine where the picked peanuts are being handled. Should the direction of the wind change after the machine is set, a change of setting may become necessary.

A device fitted with 3 levers, each with a short chain attached, provides a quick economical method for bringing the peanut stacks to the pickers. The pole is lifted out of the ground by looping the chain around the stack pole. The lever is then locked by slipping it under a hook on the frame of the carrier and the operation is repeated for the other 2 stacks to make up the load.

Sometimes a truck equipped in a similar manner is used, but it is

FIGURE 30.—Portable peanut picker.

usually equipped to haul 6 or more stacks. Unless the stacks are to be hauled a considerable distance, there is little gain in the added capacity. At the picker, the stacks are deposited on the ground, the poles pulled from the bottom of each stack, and the peanuts fed to the picker in small forkfuls, sometimes by a combination of fork and hand feeding (fig. 30).

A minimum of five men is required to operate a picker economically—one to haul the stacks from the field to the machine, one to remove the stack poles from the stacks and place the vines in small forkfuls on the feeding table, one to feed the vines uniformly through the machine, one to bag the peanuts, and the fifth to fork the hay away from the machine. Sewing the sacks and hauling them away requires additional help. Pickers fitted with feeders and elevators for discharging the peanuts into a truck body require a little less help.

WITH COMBINES

Recently, particularly in the Southwest where peanuts are commonly dried partly or completely in windrows, the combine-picker is rapidly replacing the other type of machine (fig. 31). For combine picking the peanuts are dug in the usual manner. Then 4 to 6 rows are windrowed together with a side-delivery rake or a shaker-windrow attachment. The peanuts are dried in the windrows until the moisture is reduced to a point where the peanuts can be safely stored; or they are partly dried in the windrows, then picked, and the drying completed in sacks or in bulk through the use of artificial heat. Under favorable conditions a combine can pick 14 to 20 acres of peanuts in a day.

While the windrow curing of peanuts is economical of labor, the method usually results in a product that contains a high proportion of trash, particularly small pieces of soil, stones, and other material picked up and mixed with the vines by the side-delivery rake. In areas where stack curing is practiced the proportion of trash seldom exceeds 5 percent, but where windrow curing is practiced it is much higher.

FIGURE 31.—Picking peanuts in Texas by combine.

PEANUT BYPRODUCTS ON THE FARM

PEANUT HAY

Peanut hay—or more strictly speaking, peanut straw—is a valuable roughage for feeding to farm animals. Its value depends on the proportion of leaves retained and on the methods used in the curing. The yield of the dry material as it comes from the picker is usually about twice that of the peanuts. With the Spanish-type varieties it ranges from 1,500 to 3,000 pounds per acre, and with the heavy-vined runners and Virginia varieties from 3,000 to 4,000 pounds per acre. When properly cured so that it has retained most of the leaves and has a bright-green color, its feeding value is practically the same as that of soybean, cowpea, red clover, and some other forms of legume hay.

The principal objection to peanut hay is due to the considerable quantities of dirt and dust it contains. Most harvesting operations lift the entire plant from the ground with considerable amounts of soil adhering to the roots and branches. Careful shaking and stacking removes most of this material, but some dust is always blown out of the picker with the hay.

Baled peanut hay is a standard roughage on the market, but a large proportion of the hay is used on the farms where it is produced. The baling is usually carried on simultaneously with the picking by feeding the hay directly into the baler from the picker. It is often stacked in the field and animals allowed to feed on the stacks, or it is hauled to the barn and fed as desired.

Badly weather-damaged, moldy, or otherwise spoiled peanut hay is not suitable for feeding.

OTHER PEANUT BYPRODUCTS

Lightweight partly filled pods blown out during the picking operation have value as feed for domestic animals. Shrivels and slightly damaged peanuts graded out at the shelling plant; splits, germs, skins, and sortings from processing plants; and oil-mill refuse and cake are

all used to good advantage as feed. In the Tidewater section of Virginia many fine herds of hogs are produced on a summer green crop, water, and oil-mill refuse, followed in autumn by the gleaning of peanut fields and hogging-off of corn.

GROWING PEANUTS FOR HOGS

Upward of a million acres of peanuts are planted each season for harvesting by animals, mostly hogs. This type of farming is very attractive, because the cost of harvesting, curing, and picking, which normally represent about half the cost of growing the crop, is almost entirely saved. With this type of culture the land is usually improved quite rapidly.

The cultural methods are the same as those followed with the crop grown for harvest. Usually the peanuts are planted alone, but they may be interplanted with another crop such as corn. In some cases the peanuts are planted in the same rows with the companion crop, but more often in alternate rows with another crop.

Only varieties that have a rest period, that is, those that will not sprout immediately after reaching maturity, should be used. The true runner peanuts are best adapted for this type of culture, because the pods are tight and strong and the peanuts will not sprout for about 90 days after they reach maturity and then only after the shell has been damaged so that moisture will reach the kernels. Under favorable conditions runners will stay in the soil over winter and start growth after the weather warms up in spring. Spanish-type peanuts sprout quickly, often before they can be harvested, thereby causing severe losses. They are not well adapted to culture for harvesting by hogs.

Succession plantings a few days apart, each including a part of a field, or separate fields, are often made. The animals are moved from field to field, or from one part of a field to another, as rapidly as they clean up each planting. Where the succession plantings are in one field, a temporary fence is used to confine the animals to the part that is being worked.

GROWING PEANUTS FOR OIL

Peanut oil must compete with other edible vegetable oils, including soybean oil and cottonseed oil, both produced very extensively in the United States. Although the peanut will produce more oil per acre than any of the other domestic producers of edible vegetable oils, this is only one of the factors that determine whether it would be profitable to grow peanuts for the specific purpose of making oil, oil cake, and the hay that remains on the farm.

Roughly two-thirds of each ton of well-cleaned farmers' stock peanuts consist of sound mature seeds that contain about 50 percent of oil. More specifically, the Spanish-type varieties are about 75 percent kernels that contain 45 to 50 percent oil; the runner varieties are about 70 percent kernels that contain about the same or a little higher proportion of oil; and the Virginia peanuts are about 65 percent kernels that contain 40 to 45 percent oil. The yields of nuts per acre of the Spanish type are usually lower than those of the runner and

the Virginia types, offsetting the advantage of the slightly higher shelling proportion of the Spanish.

A ton of farmers' stock peanuts will yield from 1,300 to 1,400 pounds of shelled peanuts containing 45 to 50 percent oil, of which 90 to 95 percent is recoverable by pressing. Taking the lower figures, there would be about 585 pounds of oil and at least 90 percent, or about 525 pounds, could be recovered. There would also be about 775 pounds of cake. Whether the grower could afford to grow peanuts primarily for making oil will depend on the relative prices of edible peanuts and the oil and cake. In the past the comparison has usually been unfavorable for the use of peanuts for oil.

Considerable quantities of peanut oil are being made from peanuts grown on excess acreage, damaged peanuts not suitable for the edible trade, and byproduct material from shelling and cleaning plants, peanut butter plants, salters, and others. There have been times when the prices of edible peanuts and peanut oil have been such that it was profitable to crush peanuts for oil. It has been estimated that peanuts can be grown by the simple methods required for their production for oil at much less cost per acre than when grown for the edible crop. Simpler harvesting and curing methods hold some promise in the production of peanuts primarily for making oil.

MARKETING PEANUTS

Manufacturers of peanut butter, salted peanuts, peanut confections, and bakers' goods cannot produce high-quality products unless they have good raw material. Care in the factory cannot compensate for lack of quality caused by faulty growing and handling methods. While most discolored kernels can be picked out, it is difficult to remove every damaged seed. A small proportion of bad nuts can cause serious loss of quality in the product. Lack of flavor as a result of too fast drying or of heating in the stacks cannot be corrected. It is to the advantage of the peanut grower to grow and market the kind of peanuts that will produce high-quality products. In this way, as perhaps in no other, he will increase the demand for peanuts.

United States market grades for peanuts have been established to serve as an aid in the orderly marketing of the crop. The grades for farmers' stock peanuts as they are delivered to the buyer are of immediate interest to the producer. Every peanut grower should aim to deliver peanuts that will bring a premium for quality.

GRADES FOR FARMERS' STOCK PEANUTS

Peanut grades are based upon several factors:

1. Proportion of good-quality kernels, commonly referred to as sound mature kernels. This classification excludes undeveloped kernels that pass through a specified, small-sized screen opening.
2. Degree of freedom from defective kernels, commonly called damaged kernels. Defective seed include those that are discolored, diseased, decayed, and injured by insects.
3. Amount of foreign material, or all substances other than peanuts in the shells or peanut kernels.

4. As applied solely to Virginia-type peanuts:
   (*a*) Proportion of peanuts with large, bright, undamaged shells suitable for making "hand picks."
   (*b*) Proportion of "extra large" sound kernels included in the sound mature kernels.

All buyers and operators of peanut storage plants are familiar with the details of peanut grades. Copies of the complete grades may be obtained from the United States Department of Agriculture, Washington 25, D. C.

CLEANING AND SHELLING PLANTS

The cleaning and shelling plant is a necessary step between the peanut grower and the user. Farmers' stock peanuts require careful cleaning to remove trash, dust, and damaged peanuts. The plant also shells, grades, and otherwise prepares the peanuts for the use of processors and dealers.

Individual peanut cleaning and shelling plants often handle only one type of peanut. In the Virginia-North Carolina area most plants handle only the large-seeded Virginia-type; however, some process Spanish or runner peanuts. In the Southeast both runner and Spanish varieties are grown, and the mills are equipped accordingly. The Southwestern crop is mainly Spanish, but a few Valencias are also grown.

Mills handling Virginia-type peanuts usually produce five grades of shelled peanuts: U. S. Extra Large Virginia Shelled, U. S. Medium Virginia Shelled, U. S. No. 1 Virginia Shelled, U. S. Virginia Splits, and U. S. No. 2 Virginia Shelled. Mills produce two grades of cleaned peanuts in the shell known as U. S. Jumbo Hand Picked and U. S. Fancy Hand Picked.

Mills handling runner-type peanuts produce two grades of shelled peanuts, U. S. No. 1 and U. S. No. 2. Unshelled runners are seldom offered to the trade.

Mills handling Spanish varieties produce two grades of shelled, but no unshelled peanuts. They are U. S. No. 1 and U. S. No. 2.

Peanut picking and the delivery of the crop to the cleaning and shelling plants take place within an interval of only a few weeks; therefore the plants must receive and store large quantities of peanuts within a very short period. The price paid the grower is based on the grades of samples of peanuts delivered to the mill. The stock is stored for later cleaning and handling. The normal operating period of the plants lasts from the beginning of the picking season until about the time of the planting season for the next crop, roughly October to June.

During the normal shelling season the processing industry may obtain its supplies from the shelling plant by railroad or truck as required, but many processors prefer to accumulate their season's

requirements when conditions are favorable and store the material for use as needed. Processors' requirements for the spring and summer months are held in cold storage. This prevents insect injury and retards the development of off-flavors. Good-quality shelled peanuts with a moisture content of less than 5 percent may be stored at about 40° F., with 50 percent relative humidity for 2 years without noticeable loss of quality. Shelled peanuts are extremely sensitive to the development of off-flavors when stored adjacent to many other products, and they should be placed in compartments by themselves.

The shelling-plant product includes clean, polished, whitened Jumbo or Fancy unshelled Virginias for sale at the ball park or elsewhere, extra large shelled Virginias for the fancy salting trade, and other sizes and grades for the use of other segments of the processing industry. Shelled runners and Spanish varieties are used for similar purposes.

In addition to the graded material produced by the shelling and cleaning plants, approximately one-third of the incoming tonnage of farmers' stock is shells. Some of the shells are used as fuel under the boilers of the shelling plant, but the high cost of labor and the availability of electricity have made the firing of boilers with peanut shells a generally unprofitable practice. The shells are used as a conditioner for mixed fertilizer, for making wallboard, as a mild abrasive, as litter in poultry houses and as a soil mulch, particularly in greenhouses and in the garden. The tonnage available in any one location is seldom very large, and the shelling operations are seasonal. These factors make it difficult to develop any single large-scale use for the shells.

Large quantities of damaged and shriveled peanuts (shells and trash and other material that is unsuitable for marketing as a food product) are accumulated at the peanut shelling plant. This material goes to the oil mill, to manufacturers of feeds, and sometimes directly back to the farm for feeding to animals or return direct to the soil.

YIELDS AND PROFITS

Edible crop peanuts are usually profitable for the grower who follows good cultural practices and obtains large yields, but those growers producing only average yields are likely to find the crop an unsatisfactory one. In the Virginia-Carolina area the average yield is about 1,200 pounds of farmers' stock per acre, but the better growers often obtain 1,800 to 2,000 pounds or more per acre.

In the Southeastern area the average production is only about 800 pounds per acre, but the better growers obtain 1,500 or more pounds per acre. In the Southwest the average yield for a 10-year period was only 460 pounds per acre. Some recorded yields in this area were much higher, showing that great improvement in yield and surer profits might be obtained.

LIST OF SCIENTIFIC NAMES

ORGANISMS THAT CAUSE DISEASES OF THE PEANUT AND INSECTS THAT ATTACK THE PEANUT

Diseases

Common name	*Causal organism*
Bacterial wilt	*Bacterium solonacearum*
Leaf spot	*Mycosphaerella arachidicola* *M. berkeleyii*
Root rot, or soil rot	*Rhizoctonia solani*
Southern blight	*Sclerotium rolfsii*
Meadow nematode	*Pratylenchus leiocephalus* and other species
Root-knot nematode	*Meloidogyne hapla* *M. arenaria*
Sting nematode	*Belonolaimus gracilis*

Insects

Common name	*Scientific name*
Corn earworm	*Heliothis armigera*
Fall armyworm	*Laphygma frugiperda*
Potato leafhopper	*Empoasca fabae*
Southern corn rootworm	*Diabrotica undecimpunctata howardi*
Tobacco thrips	*Frankliniella fusca*
Velvetbean caterpillar	*Anticarsia gemmatilis*
White-fringed beetle	*Graphognathus leucoloma*

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